

SEPTEMBER 1954

35 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND

Hi-Fi Is Sweeping the Country!

What's It All About?

—Page 106

Report on the
CADILLAC

HOW TO SHOOT
OVER DECOYS



**"Sports Car Racing or
Everyday Driving . . .**



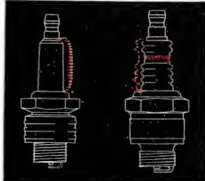
**I use CHAMPION Spark Plugs because
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—says *James H. Kimberly*

top sports car competition driver
(above) with Marshall Lewis, his
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personal car and 4.5 FERRARI.



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Double Eagle—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

This One



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SEPTEMBER 1954

1

The
pole
that
need
not
be
climbed



Fastening wires with new tool.

Since telephony began, there has been just one way to install telephone wires on poles: have a trained man climb up and fasten them there. Now Bell Telephone Laboratories engineers have developed a special pole line for rural areas. The entire line can be erected without climbing a pole.

The whole job is done from the ground. Light-weight poles are

quickly and easily erected. Newly created tools enable men to fasten wires to crossarms 10 to 25 feet over their heads.

This inexpensive line promises more service in sparsely populated places. From original design to testing, it exemplifies a Bell Telephone Laboratories team operation in widening telephone service and keeping costs down.



Key to the new "climbless" pole is this insulator. Ground crews use long-handled tools to place the wire in position and then lock it fast.

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this month's cover

THAT MUSIC-MINDED gal on our cover is being very careful about where she places the speaker, for it must balance the one installed in the door across the room. New record players, amplifiers and speakers make possible the faithful reproduction of sound. But what's all this talk about woofers and tweeters and cross-over networks? What's behind those arguments over the exact placement of speakers and the design of their enclosures? Just what is hi-fi, anyway? An authoritative feature starting on page 106 unravels the mysteries of this new family pastime. Whether your tastes run to jazz or opera, here's a story that can be your key to countless hours of pleasure

Information not listed on articles in the index, starting on page 12, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy may be obtained by writing to the Bureau of Information, Popular Mechanics, 200 E. Ontario, Chicago 11, Ill.

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Tips on car care

How to achieve greater parking safety

Many serious accidents occur at night as motorists get out of cars parked on the street. A good safety precaution against this danger is placing a strip of red reflector tape on your car doors (see illustration). This flashes a warning to approaching cars as soon as the door is opened.



How to get smoother engine performance



Today's high-compression engines out-distanced Nature's best motor oil. A better motor oil had to be made—and Texaco engineers did it! They developed Advanced Custom-Made Havoline. This great new motor oil, with its Balanced-Additive formula, helps keep those extremely close valve lifter clearances properly lubricated and quiet (see cutaway model at left). The new Havoline helps your engine stay clean, free from sludge, carbon and bearing-eating acids . . . actually wear-proofs your engine for the life of your car. Get Advanced Custom-Made Havoline today! See your Texaco Dealer . . . the best friend your car has ever had.

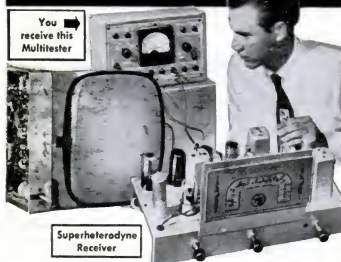
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in this corner.....

THE EDITORS



Popular Mechanics is "at home" to Californians in a new branch office opened recently in the spanking new Tishman Building, 3460 Wilshire Blvd., Los Angeles 6.



Conveniently located close to the downtown business district on famous Wilshire Boulevard, the office is headquarters for Thomas E. Stimson, Jr., Western Editor, and an advertising sales staff of three headed by Max Hunter. The telephone, if you care to make a note of it, is DUnkirk 2-8458.

Next Month . . .

Next month we distribute another big bonus to the home lover—and who isn't?

Most of our readers own their own homes. Whether you own or rent, the October issue will inspire a million of you to plan your new home or the remodeling that will bring it up to the minute in modern style and comfort.

Our first special section devoted to homes was published a year ago. In this second event of the kind we will present 50 pages of houses and remodeling ideas, hints on planning and heating, air conditioning and lighting. Highlight of the issue will be the four-color feature presenting "The Home You Asked For"—a house especially planned for us by a noted architect from the specifications of you, the readers, outlined in answer to 1000 questionnaires mailed to subscribers. It conforms to the price, size and style you dictated and promises to be a sensation. Thousands will want to build it from the plans which will be made available by the architect.

Other titles in the home section are "Is

(Continued to page 8)

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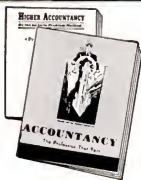
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(Continued from page 6)

the Old Homestead Worth Remodeling?" "New Faces for Old Houses," "At Home, 2004 A.D.," and one feature pictures a variety of new houses from \$7,250 to \$15,000 to please every taste.

Don't miss the October home section!

To the Editor:

When Paris was liberated in August of 1944, the American army took over the Eiffel Tower and installed at the tower's top, where the Germans previously had a radio station, the terminals for several very-high-frequency radiotelephone and telegraph circuits directed to Cherbourg, to England and forward to the armies. These radio terminals were connected by wire lines to the American Signal Center on the Avenue Kleber, near the Etoile. To bring these wires from the ground to the top of the tower, regular telephone twisted-pair wires, of the kind normally used between house and



pole, were hung from the tower's frame. These wires swung in the wind, were quickly frayed and were continually having to be replaced. To eliminate these troubles, it was decided to place a cable between the radio station on the tower's top and the ground. The job was assigned to a young Signal Corps captain.

The captain spent the evening with the handbooks and a slide rule investigating cable weights and tensile strengths and finally went to bed with a rather dim view of his assignment. Early the next morning,

(Continued to page 10)

How I foxed the Navy

by Arthur Godfrey



The Navy almost scuttled me. I shudder to think of it. My crazy career could have ended right there. Who knows, I might still be bumming Chesterfields instead of selling them.

To be scuttled by the Navy you've either got to do something wrong or neglect to do something right. They've got you both ways. For my part, I neglected to finish high school.

Ordinarily, a man can get along without a high school diploma. Plenty of men have. But not in the Navy. At least not in the U. S. Navy Materiel School at Bellevue, D. C., back in 1929. In those days a bluejacket had to have a mind like Einstein's. And I didn't.

"Godfrey," said the lieutenant a few days after I'd checked in, "either you learn mathematics and learn it fast or out you go. I'll give you six weeks." This, I figured, was it. For a guy who had to take off his shoes to count

above ten, it was an impossible assignment.

I was ready to turn in my bell-bottoms. But an ad in a magazine stopped me. Here, it said, is your chance to get special training in almost any subject—mathematics included. I hopped on it. Within a week I was enrolled with the International Correspondence Schools studying algebra, geometry and trig for all I was worth.

Came week-end liberty, I studied. Came a holiday, I studied. Came the end of the six weeks, I was top man in the class. Within six weeks I had mastered two years of high school math, thanks to the training I'd gotten.

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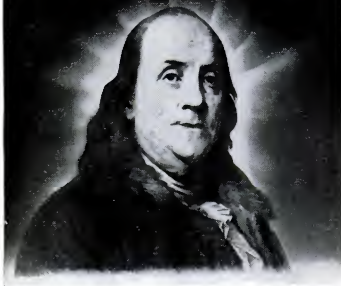
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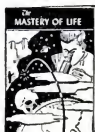
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(Continued from page 8)

he hunted up the superintendent of the tower—a French government employee—who told him the Germans had tried three times to install such a cable and had failed each time. They had first carried a reel of cable to the top of the tower, installed massive brakes and had started to unreel the cable and let it down from the top. On two tries the cable pulled itself apart from its own weight before it was halfway down. Then they set up a reel on the ground at the foot of the tower and tried to hoist the free end of the cable with hoisting tackle; again the cable was pulled in two. Here the Germans gave up.

The American captain accomplished his purpose, however, in a simple, common sense and speedy way. He had several hundred galvanized-iron clamps made by a near-by machine shop; put a reel of cable on the tower elevator and, taking the elevator up about two or three feet at a time, clamped the cable to the tower frame every two or three feet on the way up; a completely professional way of accomplishing his mission.

Carroll O. Bickelhaupt,
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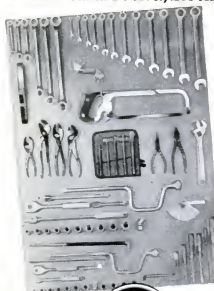


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INVENTORS

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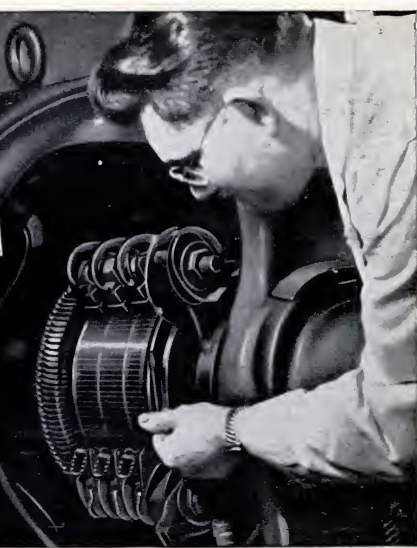
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Hot Problem in Atomic Energy

How can we safely dispose of the waste fission products of atomic energy? This is one of the knottiest problems facing atomic physicists today. W. A. Roger of Argonne National Laboratory estimates that by the end of this century there will be about three tons of "hot" waste to be disposed of each day. Diluted with water, this amount would soon poison every ocean in the world. Rogers points out that methods are under development to concentrate the wastes into solids in a form suitable for burial. The problem here is to prevent water from leaching them out and menacing the earth for decades to come. It may be possible, he says, to deposit the

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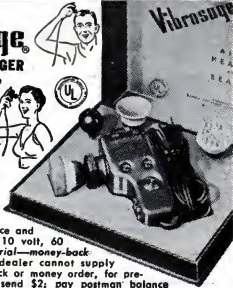
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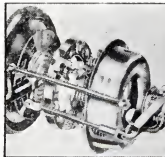
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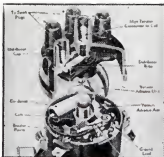
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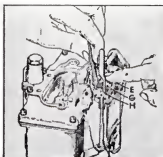
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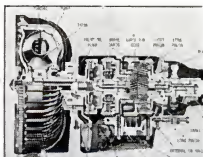
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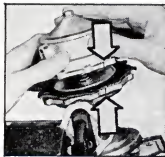


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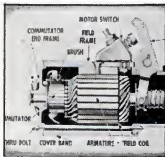


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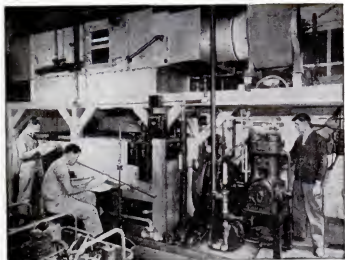


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So I feel pretty good about being in a position to help folks get the extra money they need.

Now this is not a plan to get some of your money out of you. It's just like I said above. I have a plan that makes it easy to earn extra money every month. And the way this plan works, I even send you a money-making outfit free without any charge and without any deposit of any kind. I believe that shows there are no strings attached to the offer and that I mean exactly what I say.

We both know there are a lot of ways to make extra money. But many of them have certain drawbacks. For example, a good many people don't like the idea of house-to-house selling. With my Plan this is not necessary. Then, with some companies, you are required to make a considerable investment in merchandise before any money starts coming back. I do not ask you to do this and you can start making money the very same day you start using my Plan.

Before I tell you my Plan, let me tell you something about our Stainless Steel Cookware. It is made of the very same kind of Stainless Steel we have been selling for years to the country's leading Hotels, Restaurants, Hospitals and Institutions. So you know our utensils are the finest it is possible to produce.



F. W. STRONG
Director,
EXTRA MONEY
PLAN

Stainless Steel Cookware is becoming more popular every day. The demand for it is greater than it has ever been. That's because more and more people have heard about the advantages and benefits of Stainless Steel "Waterless Cooking." This is the method that retains more of the natural vitamins and minerals and makes food more nutritious and makes it taste a lot better, too. (I'll tell you more about this when I write.)

But better food is only one of the features of Stainless Steel Cookware. Stainless Steel cleans easily — washes as easily as a piece of china. No scouring or scrubbing is necessary in order to keep it mirror-bright. Then, of course, Stainless Steel cannot rust, corrode or stain. Buy it once and you'll never have to replace it. Do you know why? It's because Stainless Steel is stainless all the way through. It can't chip, crack or peel. You can use it the rest of your life and then pass it along to your children! *It never wears out!*

Is it any wonder that so many people are turning to Stainless Steel in preference to any other kind of cookware? Is it any wonder it's so easy to get orders for cookware like this? But let me tell you something else. When your first customer gets her Carlton Cookware, it's the start of an endless chain of orders. She's so enthusiastic about it she can't wait to tell her friends. These, in turn, tell their friends and before you know it you'll be getting orders from folks you never heard of. It's one of those fantastic money-making ideas that just keeps growing and growing. That's why I say it's easy to make at least \$125 extra money every month because you have to deliver only ten sets to make that much. And if you don't think that's easy, take the case of Mrs. William Hanchow. She writes, "Got my set Saturday — already have 17 customers." Mrs. Mantell took orders for \$1400 worth of Carlton Ware the first month!

The 15 utensils and covers that make up the Carlton Set are all interchangeable. They fit into each other so as to make up 23 different cooking combinations for "Waterless Cooking," that cover 99% of all cooking needs.



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With prices so low, I figured that every family could now afford to own a set of our Stainless Steel Cookware. And, if you have some friends who haven't got it! (If the money is handy, you can offer them a Time Payment Plan on which the monthly payment is only \$5.00.)

If you have read this much of my announcement, I feel safe in assuming that you are one who would be happy to make some extra money every month. So I suggest that you get in touch with me right away so that I can give you full and complete details about my Plan. I'll be happy to send everything you need free of charge. At the same time, I'll also send you a complete order-taking outfit to show your friends and neighbors.

It is understood, of course, that I will include instructions that make it very easy to write up orders. And I will show you how to start making money immediately without any house-to-house calls on strangers.

There is no charge for these things — now or any other time. When I say everything I send you now is free, I mean FREE. And here's the best part. When you qualify, I'll even furnish you with a complete 15-piece set of Stainless Steel Carlton Ware that you can use in your own kitchen and show it to your friends. This is an extra bonus and all 15 pieces will be shipped to you free.

There is just one thing for you to do and I hope you will do it right away. Just write your name and address in the coupon and get the coupon in the mail at once. I do not say this to hurry you, but this announcement may not appear in this magazine again, and I don't want to see you miss this wonderful opportunity to make enough extra money for practically anything you want to buy.

So send the coupon now — or just send your name on a postcard and drop it in the nearest mailbox. Simply write "Send everything free" and I'll see that it goes out to you by return mail. No salesman will call on you and you won't be under the slightest obligation.

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The real-life stories of success in Mail Order read like fairy tales. If I had not personally known these people their stories would be hard to believe. Yet they are not only true, but they represent just a tiny drop of the hundreds of "little operations" who have been swept into big money by Mail Order.

GAINES. I personally guided his start when he invented an automatic pants presser. He started with one little ad in one magazine. Four years later he retired — with enough real estate to keep him in cash income the rest of his life.

VAN MARK. I worked with him for six years. I met him when he was a wagon man for a tea and coffee house, knocking on doors. He went into Mail Order on nothing—made money from the start—ended up six years later with savings of \$50,000 and an income of \$5,000.00 a year for life without further work.

DUOGAN. A few years ago he was a truck driver. Started fooling with Mail Order in a spare room in his spare time. Last year he said, "I don't know how much I'm worth—after you get the first million you quit keeping track."

MRS. NIKON. Started a small Mail Order business at home—just to keep occupied. It looked good and she came to me for advice. I showed her how to expand. In two years the business got so big her husband resigned his job to help manage it.

FOXMAN. Foxman worked as a hack driver at \$70 a week. He had idle time in the evenings—ran an ad offering something he didn't have—got so many orders he had to find a source of supply. He made \$18,000 the first year. He gives me credit for "showing the way."

JORGENSEN. Consulted me about a specialty product. On my advice he ran one ad to "test" its saleability. That ad brought sales of \$50,000. In his first year he did a business of nearly a half million dollars. His original investment was less than a thousand.

These things I have seen. These people I have helped to the realization of their dreams—their and the hundreds of others. My own fortune was made in Mail Order. And now my secrets can be yours.

L. W.

Have you ever thought of running a profitable little sideline right from your home? Has it occurred to you that you are just as capable as anyone else of making money on a product or service that can be sold by mail? Have you ever looked into the Mail Order business as it's run (on tiny investments) by innumerable small operators?

Forget about Sears and Ward's! Read about the "little fellows" . . . clerks, teachers, vets, mechanics, salesmen and others . . . who are packing Mail Order items in bedrooms, spare rooms, attics, garages, cellars . . . dumping them in the Post Office . . . and quietly banking the fistful of Money Orders, cash and checks delivered to them daily by the mailman.

An annual business of almost a billion dollars is done by "little fellows" who advertise and sell just one item! The Department of Commerce of the United States says, "A number of the most successful obtain incomes as high as \$40,000 to \$50,000.00."

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Glance at the examples at left. These true stories are far from unusual. Multiply them by the hundreds and you begin to get an idea of what can be done . . . what is being done . . . in the phenomenal Mail Order field.

Yet, if you were to jump blindly into Mail Order your chances would be slim. A peculiar brand of "know-how" is vital in this little-known, little-understood business. This is fortunate for you. If any Tom, Dick, or Harry would "click" in Mail Order, the field would have been overloADED years ago.

But now you have the opportunity to learn the authentic secrets of successful Mail Order operation. They are revealed for the first time, step by step, in an extraordinary new Survey . . . the L.W. Confidential Mail Order Letters.

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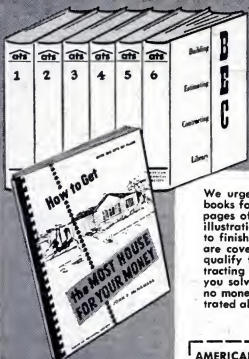
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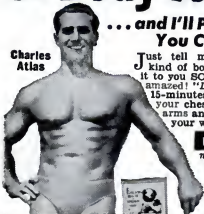
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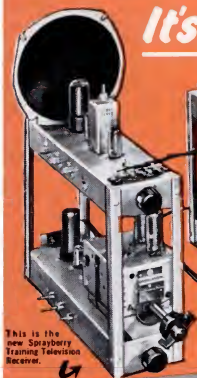
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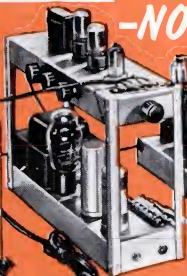
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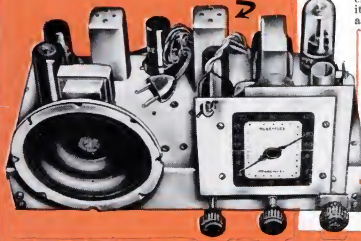
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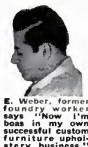
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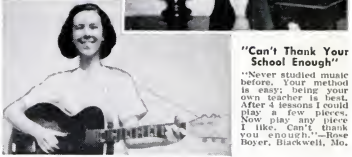
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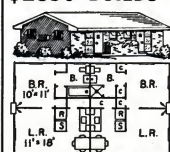
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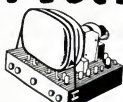
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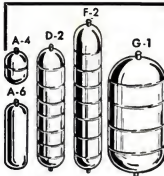
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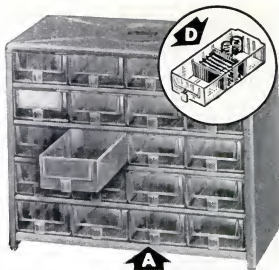
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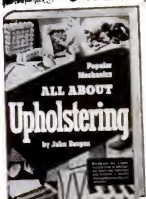
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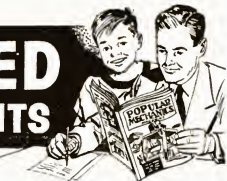


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GROW Mushrooms, Cellar, shed, and outdoors. Spare, full time, year round. We pay \$3.00. Tells how. Sample 25c. Sizemore, Free book. Washington Mushroom Ind., Dept. 172, 2954 Admiral Way, Seattle, Washington.

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\$46 FROM Square foot plywood; jig saw necessary. Write: Woodrats, Bridgewater, Mass.

\$25 WEEKLY Working two hours daily at home. Lycke, Box 2471-A, Cleveland 12, Ohio.

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MAKE Money spare or full time, casting metal toys and novelties. Big wholesale and chain store demand for autos, soldiers, ashtrays, banks, etc., keeps manufacturers busy. Production moulds are needed for up to 10 and most castings per hour. No experience or special place necessary. Write for information and illustrations of patterns needed. **Metal Cast Products Co.**, Dept. A, 1696 Boston Road, New York 60, N.Y.

OPERATE Profitable mail order business. Write **Walter Service**, 4159-A East 112th, Cleveland 5, Ohio.

GOOD Paying business silvering mirrors, plating autotops, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required. Outfit for free. **Free Booklet**, Gummetal Co., Ave. H, Decatur, Illinois.

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WHOLESALE: Sell retail, tremendous profits. Nationally advertised products. Individual purchases. Catalog \$1.00. Day, Mount Morris 12, New York.

NATIONALLY Advertised merchandise. Rush 50 cents for illustrated catalog showing retail prices to Edna, Dept. 308, 318 W. Bridge St., Morrisville, Penna.

BUY Wholesale direct. Save yourself up to 66% on 10,000 nationally advertised appliances, homewares, jewelry, sporting goods. Make big money sell to others. Free details. National Buyers Service, Box 426EA, Oakland, California.

WHOLESALE Name brand merchandise. Big discounts. Individuals buy one or 1,000 items. Catalog \$1.00 refundable first order. Transamerican, Box 815-A, Atlanta 1, Ga.

MILLION Products wholesale. List of sources 50c. Fitzpatrick, 1842 Jeanette, Abilene, Texas.

AGENTS WANTED

GIVE Your customers the best. Famous Alice Ames bronzed baby-shoes made in the biggest and best plant devoted exclusively to them. Make big money. Not available in stores. For details, write to Alice Ames, Dept. 2, Boston 36, Mass.

APPLIANCES. Cameras, watches! Large coded wholesale catalogue! Cam Company, 6806PM-20th Ave., Brooklyn 4, N. Y.

IMMEDIATE Success! Sensational profits! Use suite \$1.75, pants \$35, dresses 20c. Buy 20c. from store, homecar. Free catalogue. Superior, 1250-A Jefferson, Chicago 7.

EASY Extra income—Sell sensational new silicone scorcher resistant ironing board cover. 80c. Housekeeping approved. Terrific \$1.98 seller! Send for free complete selling kit. Sample cover \$1.10. Menell Products, Dept. P-F-O, Box 431, Mendota Station, New York 18, N. Y.

HAVE A complete store in your pocket. Buy wholesale and make big profits. Send for free general merchandise catalog now. Jay Norris, Dept. P, 445 Broome St., New York 17, N. Y.

PRINTING. Advertising salesmen—Excellent moneymaking sideline selling decalcomania name plates, small quantities. Automobile initials, sign letters. Free samples. Balco, XL Boston 19, Mass.

CALIFORNIA Sweet smelling beads. Sensational sellers. Free particulars. Mission, 2328PM West Pico, Los Angeles 6, Calif.

GOLD Or silver letters, numbers. Windows, doors, trucks, 1" to 6", 50¢ profit. Free samples. Atlas-T, 544 West 79th, Chicago 20.

\$1.00 PROFIT Selling \$2.95 photo enlargements. Free details. Allen Studio, Riegler Bldg., Little Rock, Ark.

MAKE Extra money. Sell front door name plates to friends, neighbors. Retail \$1.98; you make \$1.00! Free selling kit. Good Engraving Co., P.O. Box 194, Boston 14, Mass.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-A West 4th, Chicago.

IT'S So terrific you'll usually sell thousands! Brand new \$2.95 pocket clock protector. Sales pouring in. A tremendous deal for you. Get your town today. Federal Products, Evanston 15, Illinois.

EASY Handwork makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Massachusetts.

RUN Spare-time greeting card and gift shop at home. Show friends samples of our new 1954 Christmas and all-season greeting cards and gifts. Take their orders and earn to 100% profit. No experience necessary. Costs nothing to try. Write today for sample and complete Greetings, Dept. 186, Ferndale, Michigan.

BARGAINS. Job lots, close-outs! Save up to 50% on clothing, hosiery, notions, drugs, toiletries, gifts, jewelry, television, etc. 2000 items. 35c brings wholesale bargain catalog with special get acquainted offer which includes free \$1.00 merchandise catalog. Reliable Jobbers, 311-B North Desplaines, Chicago.

AMAZING Profits for you selling Sunshine quality Christmas cards. No investment or experience necessary. Nationally famous 21 cents for \$1.00. Sells on sight! Imprints. Currier's, religious, gift wraps, novelties. Samples on approval, write: Sunshine Art Studios, Inc., Dept. M, Springfield 1, Mass. or Dept. 3, Calif. (Note: East of Rockies address Springfield office.)

NEED Money? \$50.00 yours, sell only 100 boxes new Christmas cards. Other amazing offers. Free sample. Send for cards. Feature box assortments on approval; free catalogue, 100 profitable items. Work with a national leader. Write today. Free sample. Dept. PM-9, 139 Duane St., New York City 13.

AGENTS—Salesmen! Sell beautiful hand-colored plastic enlargements and sensational new personalized photo compacts, ring binders, desk lockers, etc. No experience necessary. 40% advance commissions. We deliver, collect. Wonderful sideline—Better full time. Free sample outfit. Novel Photo Co., 3343 North Ave., Chicago 11, Ill.

BIGGER Profits selling greeting cards. Get list of sensational factory surplus bargains. \$1.25 boxes for 50c, \$1 boxes for 35c—while they last! Big line new 1954 Christmas cards, stationery, gifts. Assortments on approval, personalized samples free! Midwest Cards, 1113 Washington, Dept. J-135, St. Louis, Mo.

AT Last! Something new and sensational in Christmas cards. Make extra money on Christmas, Valentine, and Birthdays. Gets easy orders. Pays up to 100% cash profit, 30 free samples. With name 50 for \$1.50. Big line. Amazing new glitter, foil ornaments, napkins, stationery. Several \$1.00 boxes on approval. Puro Greetings, 2801 Locust, Dept. 440-L, St. Louis, Mo.

BUY Wholesale! 30-80% discounts! Free! Large catalog of nationally advertised appliances, gifts, watches, jewelry, cameras, typewriters, tools, kitchenware, etc. Start your own fully self-operating mail order business without capital! No experience necessary. Wholesale starting kits furnished. Outline of unique automatic sales plan included. Consolidated Distributors, Division 101, 21 Lafayette, Paterson 15, New Jersey.

SHINE Cars without "polish." New invention. Lightning seller. Cars gleam like mirror. Samples sent on trial. Kriste 60, Akron, Ohio.

SEND Postcard for free money-making plan. Guaranteed direct-from-mill nylon, lingerie, women's, men's and children's wear. American Mills, Dept. 433, Indianapolis.

MONEY For Xmas! Make \$50 and more during spare time. Friends, neighbors—everyone buys from Elmira's exquisite new sparkling line. Imprinted Christmas cards for as little as 3c. Personalized stationery, name tags, wrappings with free accessories. Ribbon ties—line quality, free money saving values. No experience needed. Send name and address for free portfolio, catalog, assortment of samples. Bonus plan. Elmira's "portable gift shop" makes money first day. Write today. Elmira Greeting Card Co., Dept. C-200, Elmira, N. Y.

YOUR Own business—Used suits \$1.50, overcoats 65c, mackinaws 35c, shoes 12½c, ladies coats 30c, dresses 15c. Enormous profits. Catalog free. Moro, 1218AA South Jefferson, Chicago 7.

CASH Commissions, up to \$10 per hour. Sell new and used Ortho-Vent "Spring-Step" cushion shoes. Call on business places, industries and individuals offering them America's most comfortable shoes. High commissions, cash bonuses and exclusive repeats build you profitable business guaranteeing security. Free sales kit. No experience or investment needed. Write now. Ortho-Vent Shoe Co., Inc., Dept. PM-954, Salem, Virginia.

MAKE Money selling ties. Buy direct from manufacturer. Write to Philip's Neckwear, 20 West 22nd, Dept. 332, New York.

Big Income, full part time. Qualify as advertising match book man your area. Big cash commissions. Steady repeats. No investment or experience. Exclusive over designs. Write in detail about yourself. Territory desired. Maryland Match Co., Dept. M-3, 1100 South Eutaw, Baltimore, Maryland.

FREE Full color catalog of 160 different ways to make extra money! Sell new type Christmas, birthday, get well cards, wrappings, gifts. Big profits, plus extra cash bonus. Write for feature assortments on approval, free samples personal Christmas cards, stationery. New England Art Publishers, North Abington, 933-C, Mass.

AGENTS Wanted full or part time. Free catalog appliances, watches, etc. Box #4, Limestone, Maine.

SELL Foam. All purpose cleaner. DuMont Products, 53 Duckett Ave. Lawrence, Mass.

FREE—Big new wholesale catalog! Up to 50% saving for you, family, friends on nationally-known gifts, mdse.: hosiery, appliances, cards, etc. Also make money selling part time. Write today. Evergreen Studios, Box 846-AC, Chicago 42, Ill.

MAKE Money fast for yourself, church, organization selling friends, neighbors big value \$1.00 and \$1.25 Christmas and all occasions, great cards. Leading 21 card boxes, religious and novelty assortments. Gift wrappings, stationery, children's items, gifts, gifts. Deluxe imprinted Christmas cards. Over 100 items—profits to 100%. Experience unnecessary. Free gift for promptness. Bonus. Free selling plan, samples. Write now. Evergreen Studios, 361 Broadway, Dept. PM-34, New York.

MAN To earn \$150 up per week. Long needed invention. Advertised worldwide. Prospects everywhere. Full or part time. Exclusive. No investment. Free use of samples. Write to R. Comet, Inc., Dept. 374-M, Littleton, Colorado.

MAKE Money introducing world's cutest children's dresses. Big selection, adorable styles. Low prices. Complete display free. Write name, Hartford, Dept. M-3341, Cincinnati 25, Ohio.

SPARE Time money plus new car as encouragement bonus. Amazing 60 gauge nylon 3 pairs guaranteed 3 months. Write Wilkint, 1749 Wash., Greenfield, Ohio.

RETRACTABLE Pens. Free selling plan. Ameco, 2031 Boston Rd., New York 60, N. Y.

SELL Highly profitable French imported perfumes. Write Al Kravitz, 5524 N. Campbell, Chicago 25, Ill.

"CUT-ON" hair trimmer \$2.00 prepaid. Electric \$12.95. Lifetime photo free. Mitchell Manufacturers, Aurora, Illinois.

BEAUTIFUL Feather pictures. 200% profit! Free sample. Apartado 9036, Mexico 1, D. F., Mexico.

NEED Extra cash? Get it selling Blair's unusual line of household and food products. Every housewife a prospect. Products sent on free trial. Write Blair, Dept. 31MS-1, Lynchburg, Va.

FEATHERBIRD Pictures from Mexico! 100% fast, easy profits. Prompt service. Free details. Jacman (PM-9), Box 1342, Laredo, Texas.

NEW Hand plane for wood and plastic. M. A. Tool Co., 2980 W. Davidson, Detroit 6, Michigan.

FREE! Private labels! Exclusive sales! Own a business! Sell radio P.I. stores, mail-order supply product, plan, literature; you furnish executive management and employ salesmen. VitaMins, 2908PMA Beverly, Los Angeles 57.

BUY Wholesale 450,000 products. Literature free. Carter, Box 6011-F, Chicago 60.

NEW Plan pays up to \$25.00 an afternoon or evening at home. Write Harford Frocks, Dept. M-355, Cincinnati 25, Ohio.

FREE Hosiery! Sensational new way to earn to \$3 hour spare time! Introduce amazing hosiery by giving away free pairs to every man and woman, regardless whether or not final purchase is made! Nationally known luxurious nylon stockings guaranteed against run. New miracle one size two ways stretch nylon socks, all size. Never sag or droops. Guaranteed one full year! Buy nothing. Deliver nothing. Add cash bonus plus cash bonus to 40% Additional hose and gifts extra bonus. Postcard brings you samples of stockings and socks with money-making outfits absolutely free. No obligation. Kendex, Babylon 63, N. Y.

NEW Bathroom deodorizer. Hangs on wall. Banishes odors bathroom, kitchen. Lightning seller. Samples sent on trial. Knetter, Akron, Ohio.

BUY Wholesale—Thousands items. List free. A. Sales, 18PM City Terrace, Newburgh, N. Y.

CASH In on tremendous demand for new low-priced burglar alarm for cars, homes and farm buildings. Nothing like it. Every body wants one. 286% profit. Unique sample offer. Northwest Electric Co., 131 Main, Mitchell, S. Dak.

\$25 WEEKLY. New invention. Amazing 4200 Presto emergency tire chains, all modern auto wheels. National advertised building big demand. 3 sales daily to 1000 dealers. Selling 2400 units weekly. Territory going fast. Write Presto Chain Co., Dept. P-30, Des Moines 2, Iowa.

BUY Wholesale thousands nationally advertised products at big discount. Free "Wholesale Plan." American Buyers, 629-P Linden, Buffalo, N. Y.

SCHOOL Seniors—Be popular with classmates. Have spending money galore. Details free. Craicrafts, Box 233-L, Pitts- burg, Pennsylvania.

TWO New ball point pens, retractable and plain, with a written guarantee to write a lifetime. Refill problem eliminated. Sample done \$2.60 carded, two samples 50c. Write Trading 2400, Amsterdam Ave., Dept. M-9, New York City 33.

BUY Wholesale direct. Save yourself up to 66% on 10,000 nationally advertised appliances, homecare, jewelry, sporting goods, toys. Make big money selling others. Free details. National Buyers Service, Box 426EA, Oakland, California.

SCHOOL Seniors—Earn sensational profits introducing the nation's most beautiful graduation name cards. Largest selection. Outsells all others. Free sample kit. Printcraft, Dept. M, 1509 Maple Street, Scranton 5, Penna.

MULTIPOP Twelve bowl corn popper \$11.95 sensation. Associated Sales, 6 Superior, Toledo 4, Ohio.

NATIONALLY Advertised. Appliances, cookware, diamonds, typewriters, watches, etc. Wholesale catalog 50c. Write name, 300 Englewood Ave., Englewood, New Jersey.

AMAZINGLY Different name and address Christmas card. Terrific seller. Big profits. Free sample outfit. Printer, 1223 Spring Garden, Pittsburgh 12, Penna.

OWN Your own profitable wholesale merchandising business. No investment. Sell nationally advertised appliances, home-ware, jewelry, sporting goods, everything buys. Your own name wholesale catalog in color. We drop ship. Write General Wholesale, Box 1195EF, Chicago, or Box 3058EF, San Francisco.

FREE Directory listing. Register name, address. Receive agency offers automatically. Save time, postage. No obligation. Transamerican, Box 815-A, Atlanta 1, Ga.

ALL the King's men are making money selling advertising specialties, business builders, industrial gifts, calendars. Be a Kingsman. Write fully to: King Industries, 2970 West Grand Boulevard, Detroit 2, Michigan.

SALESMEN—DISTRIBUTORS

LEARN Where millions in profits from Bible sales have gone! Recent free proven sales course and whole story of how you can get these profits! Also free catalogue of six different Bible products. Sell real genuine leather covered Bibles and related items! Joseph W. Cain, Wholesaler, Box 3065F, San Antonio 1, Texas.

MAKE Money with fast-selling Bostonian shirts. Selling 1000 shirts a day. Send kit, actual sample fabrics, free. Bostonian, 89 Brickford, Dept. F-10, Boston 30, Mass.

PRINTING—Sales and order books, envelopes, statements, business forms with or without carbon. Erso, Bronx 72, N. Y. Free catalog.

FORTY—Niner sourdough starter. Healthfoods, pancakes, breads. \$1.00 package with recipes, territory. William G., Withrow, Box 2805, W. Colorado Blvd., Los Angeles 41, Calif.

\$10,000 PROFIT Selling printing, matches, specialties! Arrow dealer tells how he did it in giant free sales outfit. You can do it too—without experience. Write Arrow Press, 515-K Fourth Ave. So., Minneapolis, Minn.

AMAZING Invention stops slamming, banging doors! Big profits easy with lowest price! Hydraulic door closer. Free proof type doors! 10-second demonstration sells it! Kant-Slam, Dept. M-11, Bloomfield, Ind.

GOOD Man can make \$3,000 next 90 days. 100 hours. Write for details amazing NiLite glowing curbside number. Automatic free trial plan pays profits day after day. Write for free details. NiLite, 173 W. Madison, Dept. 312, Chicago 10, Ill.

30,000 WOMEN Want amazing new automatic refrigerator. Free proof send 8 out of 10 on sure-free free trial. \$250.00 weekly profit not uncommon. Rush postcard for guaranteed plan. D-Frost-O-Matic, Dept. T-102, 173 W. Madison St., Chicago 10, Ill.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-954, 7530 Greenwood, Chicago.

GET New shirt outfit free! make \$90.00 weekly on 5 average orders a day. Famous quality made-to-measure dress and sport shirts at \$3.95 up sell fast to all men. No experience necessary. Write for details. Write: Packard Shirt Co., Dept. 739, Terre Haute, Ind.

BIG Money-making opportunity. Exclusive line work uniforms, jackets, pants, shirts, coversalls. Advertising emblems. Every business prospect. Outfit free. Master Div, 259 Water, Ligonier, Ind.

ANYONE Can sell famous Hoover uniforms for beauty shops, waitresses, nurses, doctors, others. Ad popular in fabric styles—Nylon, acrylic, orlon. Exclusive styles, top quality. Big cash income now, real future. Equipment free. Hoover, Dept. P-100, New York 11, N. Y.

AD Matches! Sell amazing designs—20, 30, 40 and 240-light book matches. Bigger spot cash commissions; every business a prospect. Low prices for high quality. Repeat orders. Start with experience, no women; full, part time. Buy nothing! Sales kit furnished. Match Corp., Dept. FM-37, Chicago 2, Illinois.

DISTRIBUTORS—Large profits. Terrific repeat business. Unique tie, bow tie. Write Peacock, 400 Montgomery Street, San Francisco, California.

BRAND New patented clip on ashtray. Housewives delight in 100% profits for agents, distributors and jobbers. E-Z-Por Manufacturing Co., 4514 N. Broadway, Chicago, Ill.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 17, Chicago 4, Ill.

NEW Business stimulator. \$4.55 profit. Sample 25c. Weigand, Graham, Florida.

SALESMEN. \$50.00 In a day definitely assured, selling brand new item going to every type of food and beverage store, factories, laboratories, hospitals, etc. Samples furnished. Utility Durawear, 53 West Jackson Blvd., Dept. PM-9, Chicago 4, Ill.

MAKE Big money selling industrial brush line to gas stations, stores, factories. Joe Usher, Ill., made \$995.61 in month. Protected territory: full commissions on repeat orders. No experience needed. Sample offer sales guaranteed. Write Harper Brush, 509 Thos. Fairfield, Iowa.

100% PROFIT. Fast money for you! Take orders for Sweet Georgia Brown cosmetics. Colored people buy quick. Free sample. Write Valmor, 245JXK Michigan, Chicago 16.

SELL Advertising specialties and executive gifts for old established firm. Good thing for man with wide acquaintance among business firms. Opportunity for hustler who likes to make money and isn't afraid to make calls. Develop your own business with no investment. Leads given after you are established. Best selling season on. Write today. Newton Mfg. Co., Dept. GR, Newton, Iowa.

NEW Chemical discovery. Pro auto wax, easy way to car beauty. Free sample, information. Amazing profits. Burford Auto Finishes, 1650-20th Street, Santa Monica, California.

CALENDARS. Advertising novelties, matches. All styles, including religious, vanished. 12 sheet, girls. Hundreds of advertising novelties, book matches, etc. Fleming Calendar Co., Sales Division, 6539 Cottage Grove, Chicago 37, Ill.

WE Start you in jacket business free! Complete line of fast-selling warm leather, fur, regarding nylon jacket and cushion shoes. too! No investment, no experience. Rush postcard for free money-making sales kit. Mason Shoe, Dept. MC32, Chippewa Falls, Wis.

\$2 FIRE Extinguisher, costs you as low as 50 cents. Many other profitable pressurized spray can products. Send name. Strobel Aerosol Co., 2412 Market, Louisville, Ky.

LUTHY Aero triple electrode spark plugs outlast ordinary plugs 3 to 1. Sensational invention increases gas mileage, etc. Every car owner a prospect. Big profits for salesmen, distributors. Write Luthy Aeronautical, Dept. 449, Jackson, Mich.

BUY Wholesale thousands nationally advertised products at big discount. Free "Wholesale Plan. American Buyers, 630-D Liden, Buffalo, N. Y.

EDUCATIONAL AND INSTRUCTION

MIDLAND Linotype School. Charles City, Iowa. Civilian and Veteran Courses. Free placement. Established 1909.

MEDICAL Laboratory technique. Learn at home, Catalog free. Century College, 2 East Ohio, Chicago 11, Illinois.

CORRESPONDENCE Courses, educational books bought, sold, rented. Catalog free. Willard Bayles, 211 Essex, Hackensack, New Jersey.

HIGH School diploma at home. Licensed teachers—Approved materials. Southern States Academy, Box 144-MX, Station E, Atlanta, Georgia.

STUDY By correspondence for Doctor's degree in Psychology, Metaphysics and Divinity. College of Divine Metaphysics, Dept. P-M, 2211 North Illinois St., Indianapolis 8, Indiana.

PHYSICAL Therapy and massage. We train you at home. Earn big profits from your own private practice or work with hospitals and doctors. Free catalog. National Institute, Dept. 4-8687, Sheridan Road, Chicago 40, Illinois.

SECRET Investigation. Experience unnecessary. Investigators participate free. George Wagner, M125 West 88th, New York 24.

GROW Mushrooms. Cellar, shed, and outdoors. Spare, full time, year round. We pay \$3.50 lb. We paid \$256.14, 165.00 in few weeks. Free book. Washington Mushroom Ind., Dept. 174, 2954 Admiral Way, Washington.

EARN While you learn. Auto and diesel mechanics master this top paying trade. Many graduates earn \$100 a week and up. Approved for Korean veterans. For free information, write to Dept. 106, Naville Auto-Diesel College, Nashville 3, Tenn.

BOOKKEEPERS! Increase your earnings! Operate your own simplified "Dollar-A-Week" bookkeeping and tax service. Full or part time, details free. No obligation. Ellis, Box 200, Cedar Grove, North Carolina.

MEDICAL Laboratory technicians in great demand. We train you in your own home. Catalogue free. Imperial Technical Institute, Box 973-J, Austin, Texas.

INVESTIGATOR Training. Phillips Security Service System, 1917-B North Kenzie, Chicago 39.

USED Correspondence courses and books sold and rented. Money back guarantee. Catalog free. (Courses bought) Lee Mountain, Pisgah, Alabama.

UNIVERSITY Degrees by residence and correspondence. Golden State University, Hollywood, Calif.

GOVERNMENT Position! Home training for examination, \$9.95. Refunded if don't pass. Write. Oment Instructions, 34-CS, St. Louis, Mo.

AUCTIONEERING. Be an auctioneer. Earn big money. Term soon. Write for catalog. Kansas City Auction School, 107 Sherman Building, 3119 Troost, Kansas City, Missouri.

PRACTICAL Nursing—Learn easily at home! Spare time. Big demand, good earnings. High school not necessary. Write for free facts. Wayne School, Dept. FG-23, 2525 Sheffield, Chicago 14, Ill.

COMPLETE Your high school at home in spare time with 57-year-old school. Texts furnished. No classes. Diploma. Information book free. American School, Dept. X645, Drexel at 58th, Chicago 37, Illinois.

BLUEPRINT Reading for machine and building trades. Train at home. Learn easy blueprints in 10 days. No money. 10 easy lessons. Literature free. Belton School, 1059A North Lawndale, Chicago 51, Illinois.

EARN Money in photography! America's oldest and largest photo school trains you at home. Low cost, earn while you learn! You can quickly qualify for well-paid job or your own business. Veteran approved. Send for book. New York Institute of Photography, Dept. C-49, 10 West 33 St., New York 1.

LEARN Priceless secrets of Technical Metaphysics. Easy to learn. Only school of its kind. Write. Premier College of Technical Metaphysics, 2532 McKenzie St., Vancouver, B. C., Canada.

HIGH School—No classes. Study at home. Spare time. Diplomas awarded. Write for free facts. HF-47, Wayne School, 2527 N. Sheffield, Chicago 14, Ill.

BECOME A doctor of psychology or metaphysics. Learn secret of contentment, happiness. Win degree of Ps.D. or M.S.D. Solve your problems. Free book. Universal Truth, 5038-C Broadway, Chicago.

UPHOLSTERY. Become professional at home. Big earnings. Free book. Write Upholstery Trades School, Dept. CO-1402, 721 Broadway, New York 3.

BE Smart. Study at home. College. Write Speier, Box 101, Carson City, Nev.

ENGINEERING. College-level, home study, catalog free. Midwest Engineering School, 10293 Hillcrest, Hickman Mills, Mo.

WELDING Training pays at Hobart Welding School, Box M-941, Troy, Ohio. VA contract. Best equipment. Catalog free.

WANT A diesel job? New opportunities to increase income. Higher pay. More money. We can help you qualify. Tools. Shop method home training. Write today! Diesel, Trefre Heag HP-47, Wayne School, 2527 N. Sheffield, Chicago 14, Ill.

FREE Bible correspondence course. Worldwide. Harmer, Missionary Institute, Wildwood, Georgia.

INVESTIGATE Accidents—Earn \$750 to \$1000 monthly. Thousands of insurance companies, airlines, and steamship lines urgently need claim investigators. We train you at home spare time. Placement counsel and help. Free book—Now! Universal Schools, Dept. 109, Box 8202, Dallas 5, Tex.

METALLURGY Easily learned at home. Prepare now for this big income field. Write Fran Council, Box 150, Wildwood, New Jersey.

PIANO Tuning pays. Learn this profitable profession at home easily with patented Tonometer and mechanical aids. No knowledge music necessary. Diploma granted. Write Niles Bryant School, 3731 Stockton Blvd., Dept. P, Sacramento 20, California.

CAMERA Repairmen greatly needed! You can learn manufacturers' repair methods at home in your spare time! Free, big illustrated book tells how! Write today. National Camera Repair School, Dept. FMR, Englewood, Colorado.

BOOKKEEPERS! Discovered! Shortcut public bookkeeping. Thousand simplifications. Streamlined systems. Clients unlimited. \$6.50 hourly. Audifax, 3465B, Los Angeles.

"INDUSTRIAL Drafting Opportunities." Free booklet. Write—Industrial Training, 1704-A Frederick, Fort Worth 7, Texas.

U. S. Civil service jobs! Men-women, 18-55. Qualify for \$100 a week with \$80.00 per 23 weeks open. Experience often unnecessary. Get free 36-page book showing jobs, salaries, requirements, sample tests. Write: Frank Institute, Dept. T-24, Rochester, New York.

AFRAID To talk? Lack confidence in the sound of your own voice? Amazing home training plan quickly gives you strong, confident voice. Free booklet gives facts. Write Prefect Voice Institute, 210 South Clinton, Studio 2JW-2, Chicago 6.

BE A real estate broker. Study at home. Write for free book today. GI approved. Weaver School of Real Estate, 2023 Grand, Kansas City, Mo.

INCREDIBLE! Become mental superman overnight! Free booklet! Blou, Box 1727-MP, Hollywood 28, California.

PLAYS, STORIES, MANUSCRIPTS

NO Luck finding a book publisher? Write for free Booklet PM. Vantage Press, 120 W. 31, New York.

BOOK Manuscripts invited—Cooperative publishers since 1925. Meador Press, 324 Newbury St., Boston 15, Mass.

HAVE Your book published by Nelson-Hall, 204 South Clinton, Chicago 6. (Founded 1909). Free details.

BUSINESS SERVICE

YOUR Ideas and inventions developed. Details free. Le Roi Engineering, Box 251, Elmhurst, Illinois.

SPECIAL SERVICES

REMAINS New York City 25c each. Other cities. Foreign. Free. Mail order addresses yours, monthly rates. Prompt, reliable, confidential. Ardell, 251 W. 15 St., New York 11, N. Y.

HELP Wanted ads New York City 50c, letters 25c. Postcard 15c. 146-42 61 Road, Flushing, N. Y.

ARMIALED Remains Arabia or Lebanon. \$1.00 each. Staast, Box 2635, Dhahran, Saudi Arabia.

CARTOONING, COMMERCIAL ART, SHOWCARD & SIGN PAINTING, TATTOOING

TATTOOING Course, supply brochures 25c. Zeiss, 128 Lehigh, Rockford, Illinois.

"HOW To Make Money With Simple Cartoons"—A book everyone who likes to draw should have. It is free; no obligation. Simply address Cartoonists' Exchange, Dept. 80C, Pleasant Hill, Ohio.

MAKE Money with trade secrets of experienced cartoonist \$1.00. J. Kirsch, 3333 N. Marshallfield Ave., Chicago.

ATTENTION—Sign painters-hobbyists. 14 sets alphabet, monogram, numeral patterns. \$1.24. HFN, \$1.00 postpaid. HFN, 14 St., A-9, 4343 Lindell, St. Louis 8, Mo.

FUN With drawing. A wonderful gift. Copy anything or enlarge. Highly satisfactory. Complete set, \$1.25 postpaid. Sketchograph, P.O. Box 606, Martinez, California.

ADVERTISING AGENCIES, LETTER WRITERS, FOR ADVERTISERS

MAILING Lists, most any classification. 1000 names \$5.00. 1000 your circulars mailed with ours \$4.00. 5000 your circulars printed and mailed \$12.95. Write Dixie Mailers, King, North Carolina.

ADS Placed in out of town newspapers and magazines. Low rates. Catalogue free. Ideas that pay. Baker Advertising Agency, Successors Ankrum Agency, 189 W. Madison, Chicago 2.

SENSATIONAL Mail order advertising handbook. Methods, tests, publication rates, all the answers. Written by national agency. 25c. BT # 256. 2108 A Payne Avenue, Cleveland 14, Ohio.

FREE Copy, layout service. Mailorder ad. 1,600,000 nationwide circulation, \$28.70 incl. 24-word classified, 20 big Sunday newspapers, \$50. Advertising ratebook free. Chicago Advertising Agency (Established 1900), Chicago 4.

FREE! 1954 Advertisers Rate and Data Directory, 52 pages! E. H. Brown Advertising Agency, 20 N. Wacker, Chicago 6.

ELECTRONIC Games skill chance, window display gadgets, designed, built to order. Confidential. Olive details. Engineer, 5208-1 Oneacre, Los Angeles 43.

SALES At a profit letters for mail order dealers. \$3.00. Satisfaction guaranteed. Tom Wood, 25 East Delaware, Chicago 11, Illinois.

ADVERTISE 24 Words, 100 Canadian newspapers \$5.00. Lists free. Advertising Bureau, 10511-C Springfield, Chicago 30.

FRESH Mailing lists. Guaranteed. Opportunity seekers mail buyers agents, births. Many other classifications. Free literature. Transamerican, Box 815-A, Atlanta 1, Georgia.

RUBBER STAMPS AND OFFICE SUPPLIES

STOCK Stamps 35c each, 3 for \$1.00, 3 line cushion or pocket stamp 75c. Gummed stickers 500-50c. Any size gummed labels or stickers made to order. 100% guarantee. Steel stamps 10c. Gummed, Escro 194 Print, 8 Holt, Dayton 7, Ohio.

3 LINES \$1.00. Prompt, accurate. Graphic, P.O. Box 852, Oakland 4, Calif.

TREMEMOUS. Unequaled stamp values. 60c for 3 or 4 line cushion, indexed rubber stamp. Any 2 stamps \$1.00. Nickel steel case pocket stamp, cushioned, self-inking, 3 lines \$1.00. 23 different standard rubber stamps, any 5, \$1.00 all postage paid. Handy Stamps, Box 11691, Dallas, Texas.

3 LINES, \$1.00. Fast service. Quality printing, reasonable. Samples. Johnson Press, 443 MacDonough, Brooklyn 33, N. Y.

RUBBER Stamps by professional craftsmen. 2 lines \$1.00. Price list. South Coast Press, P.O. Box 2074, San Bernardino, Calif.

MAKE Your own rubber stamps! New miracle self vulcanizing rubber stamp discovery! Complete kit and instructions \$1.99 includes enough formula for over 100 rubber stamps. Amazing possibilities. Results guaranteed. No c.o.d.s. Quick-Stamp, Juniper Road, Scarsdale, New York.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

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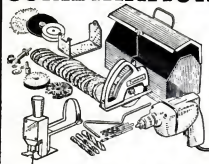


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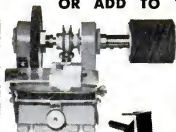
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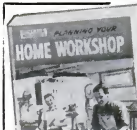
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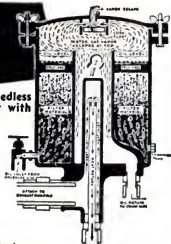
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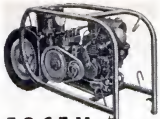
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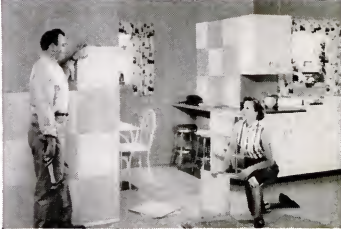
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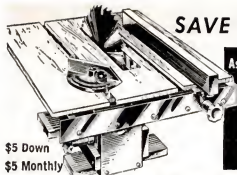
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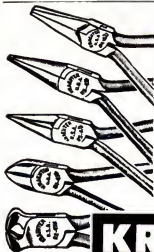
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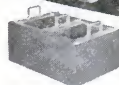
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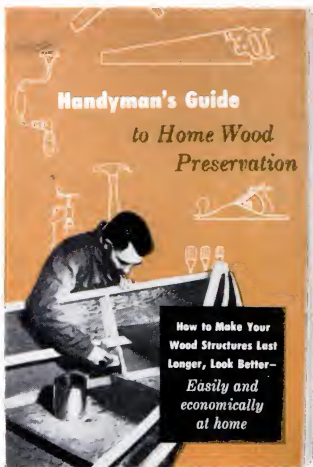
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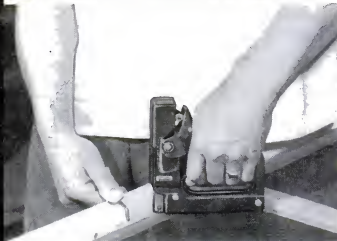
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POPULAR SEPTEMBER 1954 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 102 NO. 1

*Telephone and power lines lie broken
and snarled in the wake of flood, fire,
ice storm and twister*

After Disaster, The Trouble Shooter...

By Richard F. Dempewolf

THE AIR WAS DEAD as the inside of a tomb. Al Sadowski, operator at a substation of the Cleveland Electric Illuminating Company, was shutting the windows against smothering humidity when suddenly his lights flickered. The next thing he knew, his entire station was dead. So were the telephones.

Al didn't know it then, but less than a block away a dirty black funnel, reaching from the eerie overcast, was thundering across town with the roar of a diesel loco-

motive. Hit-skipping its way, the whirling maelstrom was overturning busses, flinging people, bricks, beds, automobiles and entire houses into the air like scraps of paper. One second the brick telephone building stood like a bulwark in the path of the oncoming monster. Then it was minus its roof and a wall.

In ten minutes the tornado had cut a 20-mile swath. Some 200 power and telephone poles were down. Twenty-eight miles of crackling, flashing wire had



grounded or been damaged. Sixty-four transformers were wrecked. Desperate hands reached for telephones only to find them dead. It looked like a total blackout of power and communications with weeks of staggering repairs.

A few years ago it might have been, but not today.

Before the twister hit, Cleveland utility officials readied a disaster plan. When the funnel roared in, 10 two-way radio cars were already feeling their way through sheets of rain to key points of the blueprint. More than 40 crews of linemen, summoned from home, stood beside their squat line trucks. As reports of damage came in from the radio trouble cars, they roared away.

High-speed mobile cranes lifted new poles into holes that had been dug seconds before by giant augers spinning off the tailboards of line trucks. Odd-looking side-armed clamshells carved trenches for new cable as fast as men could walk beside them. Mammoth Bushwackers slammed



Northwestern Bell Co. photo

Long before the 1952 Mississippi flood subsided, linemen were out in rowboats, rigging special lines to service emergency telephones along the levees

through tangled woodland clearing new line cuts. Six-inch trees tumbled before them, crunched in each machine's maw and spewed out behind in a blanket of chips. Double-jointed Skylift trucks hoisted men in steel baskets to hard-to-reach trouble spots between poles.

Fifty-four hours from the time the tornado struck, Cleveland's power was restored and phones were ringing again. Weary men rumbled homeward on their clanking monsters. Many had worked straight through without letup.

In tornadoes, hurricanes, fires, floods and earthquakes, power and communications often are among the first things hit. Keeping telephone lines open and power flowing to hospitals and disaster centers is a vital business in such emergencies. In spite of all the new gadgets that speed things along, the bulk of the job falls on the "infantry" of the telephone and power companies—the line crews. For them, every big emergency is packed with potential dynamite.

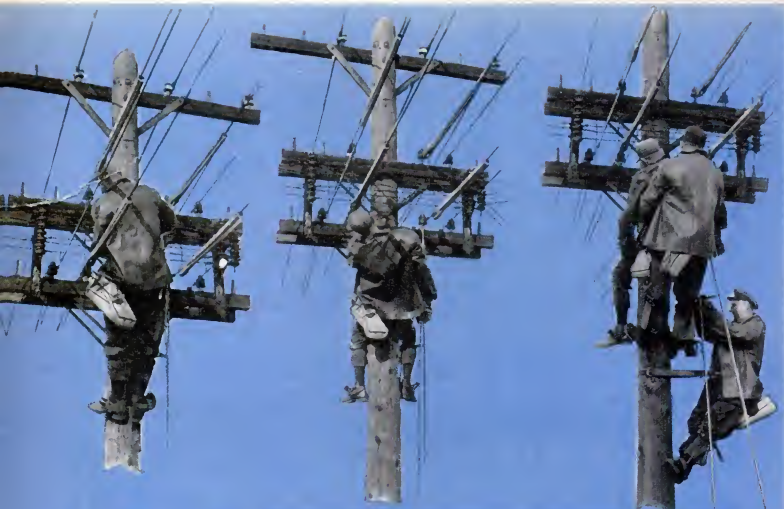
When New York was hit by an ice storm in 1953, trees crashed by the thousands, taking telephone and power lines with them across hundreds of square miles.

The night was split by vivid blue flashes and pistol-shot cracks as "hot" lines grounded against wet trees. Line crews of the Consolidated Edison Company waded into a sea of free electricity leaking across wet, icy surfaces, to cut down broken trees

Power lineman has rubber gloves and sleeves, safety belt, climbing irons, tools hung from body belt

Philadelphia Electric Co. photo





Trouble men of Philadelphia Electric carry out a mock pole-top rescue. Rubber guards placed over line have slipped back, exposing "hot" wire. Worker brushes his head against wire and is knocked unconscious. He falls back against his safety belt and fellow workers rush up pole. One unfastens the victim's safety belt while the other throws a line under his arms and over the crossarm on the pole. Victim is gently lowered to the ground and co-workers administer artificial respiration



and poles festooned with ice-coated wires. But before a line was cut, the men had to be sure trees draped over it didn't fall on houses, cars, people, or produce "hot crosses" with energized lines still carrying power. Yet, within 72 hours, these men had restored 6300 telephones to service, replaced 14 poles and 136 miles of line without a fatality.

In a similar three-day battle, telephone linemen using trucks and rowboats battled a horrendous Mississippi flood two years ago. Thirty-five miles of fast-strung line and 61 outdoor-telephone shelters erected along dikes and levees enabled sand-bag crews to coordinate activities fast enough to raise the dikes and save St. Paul and Minneapolis from the worst Mississippi flood in recorded history.

Besides this, the line crews moved and saved 15,000 phones and 25 PBX systems from flooded towns. They installed tielines, teletypewriter and other emergency communications wherever needed, and filled underground cables with pressurized gas to keep water out. Their fast work enabled disaster units to place 50 percent more long-distance calls than normal in the area, although flood waters had destroyed 236 regular long-distance circuits.

Men who make up line crews are a well-trained, rough-and-ready breed whose job requires brain as well as brawn. Line Foreman Joe Bain and his crew at the Philadelphia Electric Co. are typical of thousands of such outfits.

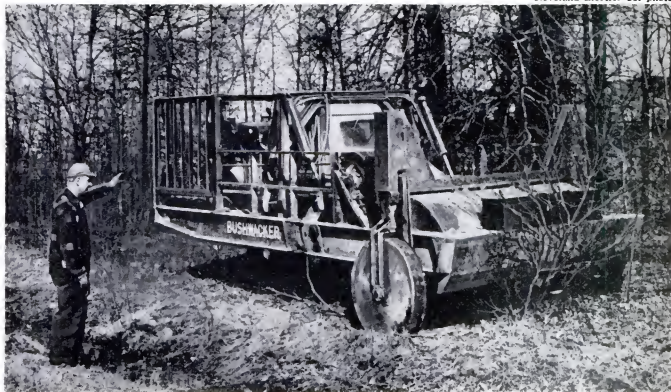
Their truck has a built-in swivel ladder like the one on a modern hook-and-ladder



Cleveland Electric Illuminating Co. photo
Electric pole stuck into roof top by tornado posed problem for Cleveland crew. Some wires remained hot

Bushwacker used in Cleveland chews up brush and large trees, spits them out the back as fine mulch of chips

Cleveland Electric Co. photo





Philadelphia Electric Co. photo

This trouble-shooting truck for power lines mounts a swiveling extension ladder. Side compartments contain assortment of spare parts and equipment. Lineman, below, slips rubber "snakes" over hot wires before he starts work. "Boots" cover joints



fire truck, only smaller. Actually the truck's a rolling electrical shop carrying a full store of wire, insulators, splicing gear, fuses, disconnects, a transformer, rubber blankets and hose for covering hot pole-top equipment, plus a vast assortment of odd-looking nuts and bolts stowed in drawers and compartments inside and out.

Here's how the crew would work if you lived in Philadelphia, your lights went out in a storm and you rushed to call the utility:

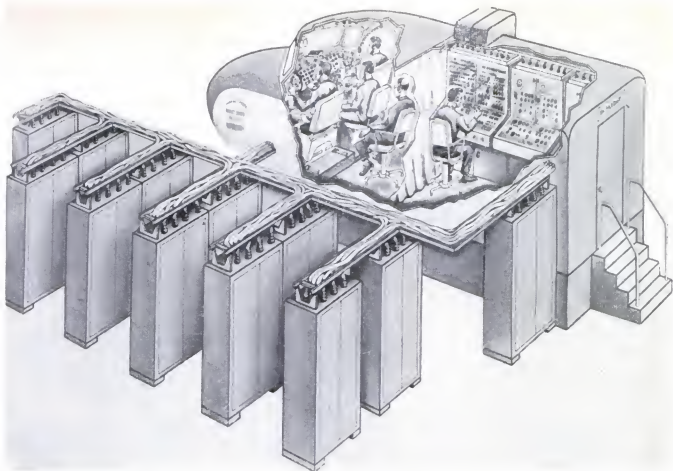
Your call would come in to one of 12 operators at six switchboards "which," explains John Zimmerman, chief supervisor, "are all lit up like Christmas when a big 'outage' hits." The message is flashed instantly by Tel-Autograph to the load dispatcher's office, where load checks would quickly show any circuits in trouble.

One of a battery of complaint takers would then write your name on a card and drop it on a moving belt that would carry it to the "trouble desk." Here, one of four trouble dispatchers handling about 500 complaints a day (twice as many in storms), would telephone for a one-man trouble car to go out. Meantime your neighbors are calling, too. A check on the wall map shows a whole neighborhood circuit may have tripped. The trouble dispatcher plugs in his radio and goes on the air to the moving car: "Outage from 2800 to 3100 block. Check transformer at 39th Street." He orders a second car, just in case.

Perhaps the cars report two crossarms down—struck by lightning. Hot lines drag the streets. The trouble men, wearing rubber coats and gloves, probably have shinnied up the poles, cut the broken lines and rerouted the circuits. But chances are that any lines clear of street and pedestrians are still hot, because any utility tries hard to keep service going to its customers. And here's where Joe Bain and his linemen get into the act. Their job is to put the "tripped" circuit back in service.

A unique array of equipment and techniques helps them perform what otherwise would be an impossibly dangerous job, because there's often enough current floating around the top of a pole to

(Continued to page 266)



Airline Pilots Fly Anywhere in World—Without Leaving the Ground

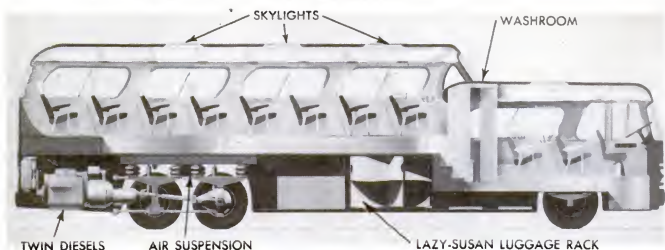
Airline pilots now can take off or land at any airport in the world—while sitting on the ground! United Air Lines, at a cost of more than \$3,000,000, has purchased four flight simulators for pilot training. The simulators, built by Curtiss-Wright, actually are huge "electronic brains" capable of reproducing any airplane flight with great realism. Attached to the simulator is the nose of a real plane, complete with all the flight instruments. The instructor sits at an instrument board behind the crew, and by manipulating the instruments

he can feed any type of information into the simulator, which transmits it to the flight instruments. As the pilot takes action to correct any condition, the simulator automatically trims the plane, dumps the fuel or feathers the propeller—all on the pilot's instruments, of course. Noises such as the sound of the engines and the screech of tires on the runway make the "flight" even more realistic. The simulator is so accurate that it has been used to check the performance of an aircraft before the plane even left the ground.

Car-Window Screen Keeps Out Sun

Motorists can protect themselves from the direct rays of the sun without blocking vision or ventilation by a Venetian-blind screen that fits into the window opening. The screen keeps out the sun just as a Venetian blind does because the horizontal wires are flattened and tilted to face the sun. It is held in place by the window glass. Extension arms permit the screen to be tilted if desired.





Two-Level Highway Bus Has Private Washroom

Five feet longer and one foot higher than a conventional intercity bus, a new Greyhound Scenicruiser seats most of its passengers high on a rear deck providing unobstructed vision in all directions. The extra five feet of length provides additional legroom between seats and space for a complete toilet and washroom. Three steps lead to the upper deck. The driver and 10 passengers ride on the lower level while 33 more passengers sit upstairs. Tinted skylight windows in the roof provide upward vision in mountainous country. These \$49,000 highway cruisers are powered by two four-cylinder diesel engines, each producing 150 horsepower. Either engine can move the bus alone if necessary in case of breakdown.



The busses are completely air conditioned and individual smoke vents enable passengers to smoke without annoying others. Built by GMC Truck and Coach Division, the bus also features air suspension which eliminates metal leaf springs. Another feature is a Lazy Susan luggage compartment.



Dotted line is where usual blade stops. New type wipes $5\frac{1}{2}$ inches more

Wiper Goes Around Wrap-Around Glass

Windshield-wiper engineers have come up with a blade that reduces the blind spot on wrap-around windshields by 60 square inches. The blade travels $5\frac{1}{2}$ inches farther into the blind corner of these extra-large windshields and does it without scratching. The new blade permits the pressure to be increased to 11 or 12 ounces (conventional blade pressures are from 6 to 8 ounces). The blade is held erect at all times and wipes without chatter.



Boeing's Jet Transport Flies to 42,000 Feet in First Tests

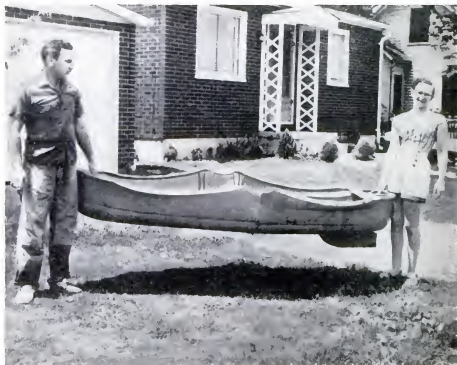
Test flights of Boeing's new jet-transport prototype (see "America's First Jetliner," *PM* Aug.) have already carried it above 42,000 feet and over 550 miles per hour. The prototype, which is America's first entry into the jet-transport field, will be followed by production models scheduled for completion in the fall of 1956. The military version of the plane, the Stratotanker, will be able to refuel military jet aircraft at high altitudes and high speeds. The commercial version, the Stratoliner, will carry from 80 to 130 passengers, whisk-

ing them across the Atlantic in seven hours or across the continent in less than five hours. Britain's ill-fated Comet carried only 48 passengers. In the tests, the Boeing 707 climbed at maximum rate and, with wing flaps lowered and landing gear down, descended at a mile a minute. It was deliberately stalled to test flying characteristics and control. It was banked again and again at all speeds to test lateral control. All reported tests of the \$15,000,000 plane were successful. The huge craft is 128 feet long and has a 130-foot wingspan.

Two Auto Hoods Make Boat

Scrapped automobile hoods looked like the "makings" of a boat to Elroy Joellenbeck of Okawville, Ill. He obtained two 1940 Ford hoods and welded them together to form a seaworthy little craft for less than \$10. Joellenbeck brazed a small fin-type stabilizer to one end of the boat.

(During the 17-month period from Jan. 1, 1953, to June 1, 1954, Military Air Transport Service (MATS) airlifted more than 731,000 passengers without a single fatality.





"House of the 21st Century" has rustic shake roof and board-and-bat siding. Makeshift fence is only temporary

Built for Modern Living

A HOUSE OF MAGIC

By Thomas E. Stimson, Jr.

IN JACK FLETCHER'S new home, the windows close themselves whenever the wind blows hard for more than 15 seconds. They close automatically, too, when a rainstorm starts or when the outside temperature drops too low for comfort.

Guests never trip over the wires to a floor lamp in Fletcher's living room. The floor lamps in this "House of the 21st Century" have no electric cords. Their fluorescent tubes, in fact, could be burned out and still operate perfectly when placed over certain spots on the living-room floor.

Mrs. Fletcher's stove has an attractive hardwood top and she does her cooking over the stove, not on it. A concealed electromagnetic cooking element not only heats the pans but keeps them suspended in the air while the meal is cooking. There's no need for an "old fashioned" metal stove top.

If the children start quarreling in their play yard, Mrs. Fletcher can admonish them at once from the house via a loud-speaker attached to the play-yard wall. She sees the youngsters by means of a television camera that scans the yard area and is linked to TV receivers in the kitchen, living room and master bedroom. These picture tubes also receive standard TV programs.

In the Fletcher house you don't need to press a wall switch to turn on the room lights; they turn on automatically as you

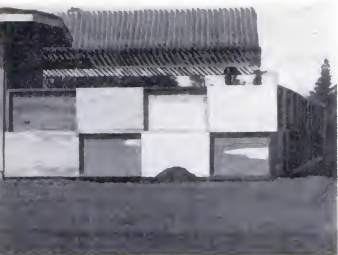
enter a room, then switch themselves off when the last person leaves. This "walk-a-light" switching system likewise rings the doorbell when a visitor approaches and serves as an alarm against prowlers.

To phone his office or various friends Fletcher presses a button opposite the name he desires, then lifts the receiver when a signal lamp shows the connection has been made. The actual dialing of the number is performed by a concealed rotary switch.

One of the fantastic features of Fletcher's

"Window brain" with rain troughs, weather vane and wind gauge, shuts windows exposed to bad weather





Right, pan floating above radical range is heated and repelled by coils under range top

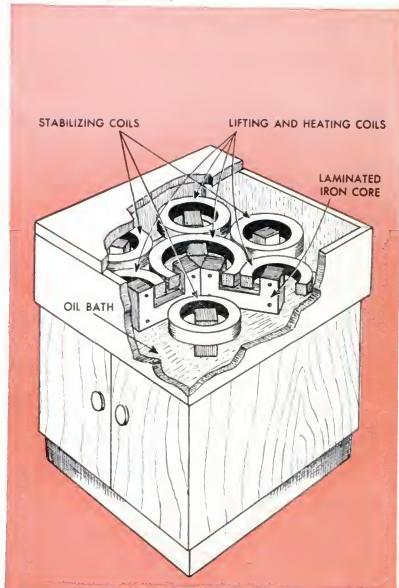
house is that its fireplaces have no chimneys. The secret is that the flue doubles back down from above the fireplace opening, then runs under the floor to a central chimney in the middle of the house. It's an old Chinese principle, so ancient that it seems brand new when put to use.

When 23-year-old Jack Fletcher, ex hot-rod and custom-car enthusiast, got ready to build a house for his growing family he decided to make science go to work for him. A lot of well-known scientific principles, he reasoned, can be put to everyday use.

Together with his father, Frank Fletcher, one of the heads of Fletcher Aviation, and with John Scott Campbell of CalTech he set up a laboratory to turn his ideas into realities and to build the equipment for his new house which is in West Covina, Calif.

Electrical gadgets aren't the only innovations in the house. The Fletchers drew on their aircraft and engineering experience to work out some new basic construction techniques. The result is that Jack Fletcher's new home is an example of quality construction at relatively low cost.

The house includes three bedrooms and two baths and has a total of 1905 square feet of heated area. Heating is of the electrical radiant type, there being chrome-nickel wire buried in the concrete slab floor. Constructionwise, the house uses a post-and-beam structural system to support the roof. All walls and partitions





Bedroom wall consists of slab doors permanently set at a stagger. Movable glass panes will be between

thus can be simple nonload-bearing curtain walls built up from short inexpensive lengths of material. The wall panels, in fact, were assembled at a temporary factory instead of on the job. They consist of one-by-six-inch vertical stiffeners nailed to two-by-four horizontal spacers. There are no vertical studs in the ordinary sense. Any scrap lengths of wood as short as 29 inches can be used.

This wall core is erected, then building paper and insulation are added, and finally the exterior and interior wall surfaces are applied. In Fletcher's home the exterior consists of redwood boards and bats. Wall-board paneling is used in the interior.

Steel-pipe columns support the roof beams. The beams are hollow and are built in accordance with aircraft design. A typical beam may consist of a two-by-six on top, a three-by-six on the bottom with 16-inch-deep walls of one-half-inch plywood and with an internal wood stiffener every eight feet. One of these beams will support a 25-foot span and can be nailed and glued together "by the mile" at less cost than solid timbers. For some shorter spans two-by-fours are used for the top and bottom of the beam.

To provide privacy, light and ventilation in his bedroom Fletcher used slab doors for one exterior wall, the doors being staggered to create a louvered effect. The space between each pair of door panels contains a narrow pane of glass for ventilation.

Patio areas outside the house have louvered roofs that screen out the sun and yet permit air to circulate. The patio-roof boards are set on edge, in slots, and may be

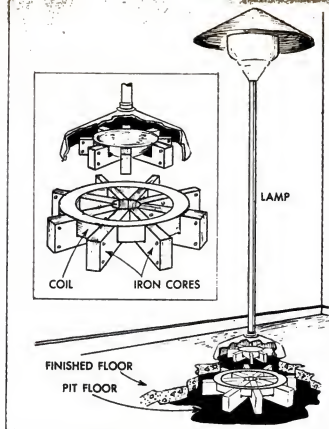
removed when winter sunlight is desired.

Fletcher's self-closing windows are actuated by a "window brain" located on the roof. The brain is actually a metal box with rain-catching channels on each side and with a weather vane and anemometer on top. Inside the box is a bimetallic thermometer. When bad weather strikes, the instruments actuate an electric circuit. Solenoids beneath the windows trip locks to release springs which close the windows.

Mrs. Fletcher's mysterious stove operates by electromagnetic repulsion. Be-

Wood louver roof over patio provides shade in summer, may be lifted out for additional sunlight in winter





Cordless floor lamp relies upon induction coil buried in concrete slab floor, secondary coil in lamp base

neath the hardwood stove top are four main lifting coils that also heat the metal pan floating above it. Three adjustable stabilizing coils steady the pan.

To operate his cordless floor lamps, Fletcher buried induction coils at various points in his living-room floor. Contained in the base of each floor lamp is a secondary coil. The current flowing between the coils provides enough wattage to fluoresce the gases in the fluorescent tube at the top.

The walk-a-light switching system throughout the house operates on the capacity principle. The presence of a person's body changes the capacity of a plate

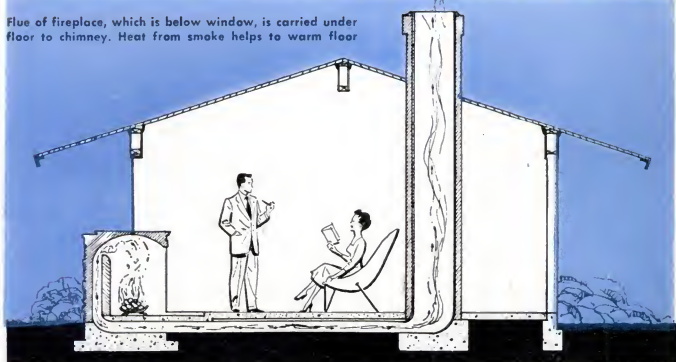


John Campbell shows that fluorescent tube of lamp glows brightly even when lamp is lifted from floor

connected to a vacuum-tube circuit. A relay then switches on the lights. The same capacity effect operates the doorbell when a person walks onto the porch. It is used outside the house to operate lights and on a burglar-alarm system.

By the time you read this, Fletcher may have added some other improvements to his house. He and John Campbell are studying the feasibility of an outdoor air conditioner that would keep the large patio areas at comfortable temperatures even on the hottest days. And they are thinking about an invisible ultrasonic screen that would keep flies away. ★ ★ ★

Flue of fireplace, which is below window, is carried under floor to chimney. Heat from smoke helps to warm floor

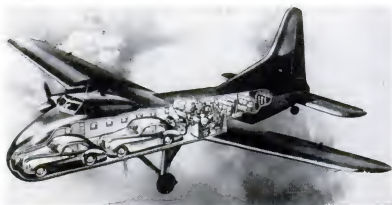




Plane carries two large or three small cars. Air lift is popular with tourists who take their cars with them

British Air Ferry Takes Automobiles Across English Channel

Flying two or three automobiles and up to 20 passengers at a time, Bristol Superfreighters have ferried more than 25,000 cars from England to the Continent since early 1953. Cost for a car on the 20-minute cross-channel hop is about the same as the boat fare. By moving a wooden partition, space can be made for either three 14-foot cars and 20 passengers, or two of the largest American makes and 12 passengers.



Key Card Inserted in Slot Opens Gate of Automatic Parking Lot

Inserting a key card in the slot of an electronic control device opens the gate of an unattended parking lot. As the car enters the lot, the wheels depress a treadle which automatically closes the gate. Exit is made in a similar manner. The card

contains bits of metal arranged in a coded pattern. A magnetic scanner in the control device "reads" the pattern and actuates the gates. New cards may be issued and the mechanism adjusted to the new code at the start of each rental period.





Truck dumps remains of radioactive building in 600-foot-long "grave" a safe distance from the laboratory

"Hot" Building at Los Alamos Gets a Careful Burial

WITH GREAT CARE and ceremony, a historic frame building at Los Alamos, N. Mex., has been torn down and buried. It is the building in which the nuclear parts of the first atom bomb were born. But the ceremonial burial is not the result of any historian's sentimentality. It's because some room surfaces of the famous building became contaminated with alpha-particle emitting material. These alpha particles travel only an inch or so in air and are stopped by paper or a coat of paint, yet are dangerous to humans. For safety during use, it was only necessary to cover the walls periodically with fresh wallboard or paint. But in tearing the building down, such protective shields are broken, endangering the workmen. The sections were painted as soon as they were torn down and then trucked to the "cemetery." Cars with air samplers followed the trucks like mourners in a funeral procession to make sure no dangerous particles escaped. Dumped into a "grave," the materials were buried under 20 feet of earth.

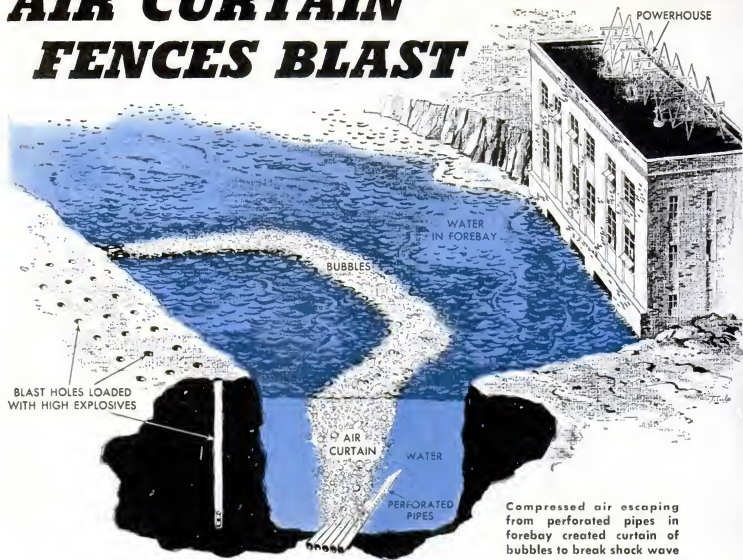


Los Alamos Scientific Lab photo

Radiation safety monitor checks roof-mounted exhaust fan for possible radioactivity. Below, workmen wear protective clothing to guard against radioactive dust



AIR CURTAIN FENCES BLAST



A WALL OF AIR BUBBLES prevented the knockout of a Canadian power station recently, as engineers touched off 12,000 pounds of high explosives in nearby rock. The project took place at the huge Ontario hydroelectric-power installation at Niagara Falls. Water had to be channeled from the forebay of an old powerhouse to the forebay of a newly completed generating plant. Separating the two reservoirs were 12,000 cubic yards of hard rock. The rock plug was only 160 feet away from the screen house of the old generating station, and a blast sufficient to dislodge the plug would have damaged the building severely. Shock waves carried through the water would have rocked the structure. Piece-meal blasting would waste time.

A Canadian explosives engineer, "Lap" LaPrairie, suggested the unique solution. The plug could be removed with a blast, he believed, if an air buffer was inserted between the screen house of the generating station and the plug to be blasted. This could be done, he suggested, by forcing compressed air through pipes laid down at a strategic point in the forebay. LaPrairie had never tested his idea, nor heard of its use. First the theory had to be tested.

A tank was built in a Toronto laboratory and perforated pipes laid in its bottom. Compressed air was forced through the perforated pipe to create a wall of air bubbles across the middle of the tank. Blasting caps were set off in the water at one end of the tank while instruments fastened at the other end gauged the intensity of the shock. Weeks of tests proved the idea sound.

At Niagara Falls, a central pipe was laid in the bed of the forebay between the rock plug and the generating plant with four lengths of perforated hose running parallel to the main pipe. When compressed air at 90 pounds pressure was forced through the 250-foot lengths, the water "boiled." Water level immediately above the pipes was raised almost four feet.

Nitro explosive was placed in the rock plug and detonated. The blast sent a huge wave traveling down the eight-mile power canal. The rock plug was completely shattered, but the power station was undamaged. Shock waves reaching the building were cut 98 percent by the air curtain.

Project engineers predict that the technique will be used to save time and money in other blasting work. ★ ★ ★



Rock plug separating forebays was loaded with 12,000 pounds of explosives. Power station was 160 ft. distant



Huge wave was created by blast, but air curtain absorbed shock waves. Only a tremor was felt at powerhouse. Below, rock barrier was completely shattered by massive charge of explosives. Cost of project was \$2000



Detroit Listening Post

By Leo Donovan



THE SPOTLIGHTS OF 1955 will shine on Chevrolet, Ford and Plymouth as they battle for the lion's share of the low-price market. But don't lose sight of another vigorous struggle at the opposite end of the price scale. Cadillac, Lincoln and Chrysler will be swinging hard for leadership in the prestige field. And Packard, the independents' candidate, won't be holding back either.

Cadillac, long dominant in this market, may become a victim of its own success. As more and more of any product is sold, the prestige value of each diminishes under the simple law of abundance.

It is this possibility that Chrysler hopes to capitalize on with its 1955 entry, the Imperial. Advance rumors are that it will be completely new. No longer will it be the Chrysler Imperial—it will simply be the Imperial, a separate, exclusive name plate. It will have a V8 engine capable of higher speed than any in mass production, an improved transmission, better springing and more luxurious appointments than ever. It will have its own styling, distinct from Chrysler.

Lincoln, which gained in sales position this year, may have its own transmission (replacing Hydra-Matic) and a more powerful engine. It is expected to make major face-lift changes. Eventually, Lincoln may be a separate division with the revived Lincoln Continental becoming the swankiest vehicle in the Ford family. However, the first of a very limited production of the Continental is not expected until late 1955.

Packard's Plans for 1955

Packard, surviving economic pressures better than most independents, has big plans for 1955. Its new V8 engine and body styling probably won't be announced until early in January. This year the Packard Clipper becomes simply the Clipper with distinctive styling of its own—another move to recapture prestige for the big Packards.

Studebaker will have engine surprises to offer as well as a completely new line.

Chevrolet, Ford and Plymouth all will boast entirely new bodies and new V8 engines (Ford's will be adapted from the 1954 Mercury). Pontiac and Mercury will be new, too. And a V8 will probably show up in the Nash family. Word is out that Nash is buying the new Packard V8 engine.

Both Ford and Chevrolet are expected to announce in October or by mid-November, to be followed by Plymouth and perhaps the whole Chrysler lineup before December first. Pontiac will be out late in October, with the rest of GM following.

Mercury is expected to boost horsepower to 175, as Ford moves up to 160.

At Chrysler Corporation everybody's as excited as an expectant father—and also as apprehensive! It is an important year as stylist Virgil Exner's new look makes its debut. Early plans called for a tooling program of \$130,000,000 and guesses are that even more than that was spent.

Plymouth, the bread-and-butter winner of the Corporation, is the car to watch. With its V8 engine and Exner styling, it is new all the way through. You won't see any more references to that "compact design" or the "smaller on the outside" feature—the Plymouths are expected to be long, low and luxurious. And Dodge even more so.

But Small Cars Still Sell

While other cars keep getting longer, Nash says its small cars, the Rambler and Metropolitan, are selling well with Metropolitan sales surprising even the optimists. Don't expect any change in this tiny import for 1955, but there may be a welcome difference in the Rambler. The story is that the full-skirted front fenders are gone. With full front-wheel cutouts, the popular Rambler will become as maneuverable as a small car should be.

The Statesman and Ambassador may be late getting out because of styling changes. Rumor is that they will get wrap-around windshields. Incidentally, the wrap-around glass has taken over the industry. All but two or three makes will have it in 1955.

Hudson is expected to be late coming out as it probably will adapt its new styling to the Nash body shell. This may mean the end of Hudson's step-down design.

It can now be foretold that Reo Motors may soon introduce a plastic-bodied truck—opening a new field for plastics.

Speaking of plastics, Chevrolet cut Corvette production from 1000 to 300 a month as sales lagged. Now Ford's Thunderbird, its steel body even more suitable for mass production, will be out in October. Is there a market for such sportsters? Some say it's a limited fad that imports can best satisfy. They see more future in a low-silhouette station wagon.



Human Squirrel Cage

Five persons at a time can ride machine.
Others wait their turns or simply watch

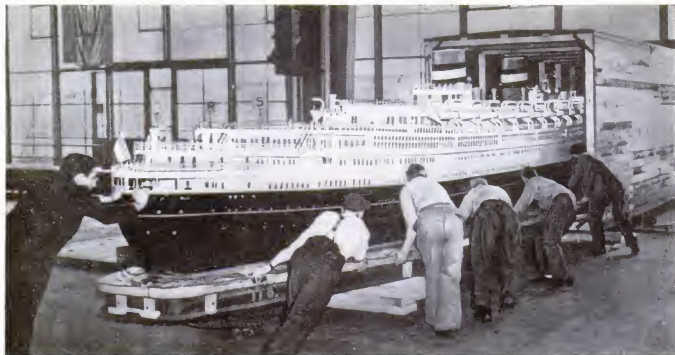
THRILL ADDICTS registered their screaming approval of a German-made fun machine introduced at Chicago's Riverview Amusement Park this summer. Little cars circle a drum 27 feet in diameter which supports five circular tracks. The cars are loosely attached to the tracks and, by oper-

ating a foot pedal, the rider can lock his car to the track. As the drum revolves at about 15 miles per hour, the cars go around with it. Timid riders can release the brake pedal and their cars merely rock back and forth. But braver souls press the pedals and make like squirrels in a squirrel cage.

After a round or two, fright wears off and riders begin to enjoy it. Lap strap is a safety measure

Brake linings are replaced every day or two. Young riders must be capable of reaching the brake pedals





Ship Model Tours Country for Display at Boat Shows

Probably the largest ship model ever built has been sent to this country from The Netherlands for display at boat shows. The model is 40 feet long and weighs 1½

tons. It is a 1/20 size reproduction, complete to the last porthole and lifeboat, of the SS *Nieuw Amsterdam*, flagship of the Holland America Line fleet.

Boat Hanger Keeps Them Dry

Boats are lashed high and dry at Pittwater, a suburb of Sydney, Australia. When not in use, the boats are pulled up out of the water and hung from a high, narrow pier. A winch mounted on a traveling cart is used to elevate the boats. The method protects the boats from damage caused by storms which chop up the water, and makes sure that water doesn't splash into the boats and necessitate bailing. It also helps to protect the boats' hulls against water.



Builds New '41 Car

When Fred Schults of Phoenix, Ariz., got a new car he did it the hard way. He found an unused frame, axles and wheels for a 1941 Plymouth in a warehouse. Then he began writing letters. He finally rounded up the parts needed to make a brand-new car—about a dozen years late! Total cost for parts: \$650. Counting his time, the total bill for the car would be about \$1000.

**Next
Month
You'll
See**



Our Big 1954 Special Section ON HOMES

Including

THE HOUSE OUR READERS ASKED FOR

3561 PM READERS HELPED PLAN IT BY ANSWERING OUR QUESTIONNAIRES.
A NOTED ARCHITECT DESIGNED IT THE WAY YOU WANT IT BUILT

50 PAGES OF FEATURES:

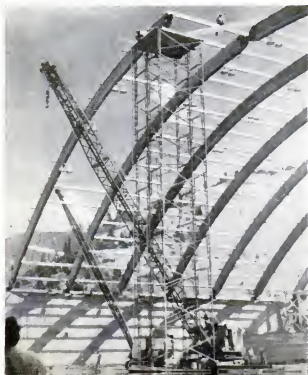
- An Album of Homes, \$7,000 to \$15,000
- How to Know Whether to Remodel
- Space Savers for Heating and Cooling
- New Faces for Old Houses
- Tips on Lumber, Lighting, Doors
- How Much Will It Cost?
- Three Men Who Built Their Own Homes Say "We'd Do It Again!"



You get an idea of the huge size of these timber arches from this picture of a man working on the footings

Nature needs man's help to "grow"

200-FOOT TIMBER ARCHES



TREES JUST DON'T grow big enough to suit Timber Structures, Inc., so the company "grows" its own timbers, some of which arch 200 feet like giant wooden rainbows.

Outstanding example of the use of such giant timbers is the new field house of Montana State University. The wooden arches that support the roof of the 200-foot structure were virtually "factory grown" to size.

Many layers of planed and seasoned lumber are combined to create the structural units. Special machinery applies glue to both sides of the lumber, creating a permanent bond which is even stronger than the wood itself. With the glue applied, the planks are laid into

Too long to move in one piece, the arches were shipped in two halves which are being joined here on the site

jigs and bent to follow the contour of a full-size pattern of the desired arch timber. Tremendous pressure is required to curve the layers of planks around the jig.

When the glue has set, the jigs are removed and the timber arch is ready for finishing. As with structural steel members, each arch timber is cut and drilled in the factory and shipped to the site ready to be erected. Each is tailor-made for the project.

Giant arches such as those in the Montana field house were so large that they had to be shipped in two sections, each consisting of a half-arch. Said to be the largest timber arches ever made, they are dimensionally stable and less expensive than steel construction.

The cost of the completed structure, according to the architects, will be about \$12,000 lower than if steel timbers had been used.

An additional saving will be made each year as a result of the lower fire-insurance rates earned by the superior fire-resistant properties of heavy-timber construction. This apparent contradiction is due to the tendency of steel to deform under extreme heat while heavy timbers such as these arches maintain their shape and sustain weight longer, even though the wood itself is combustible. ★ ★ ★



Like a suspension bridge between Montana hills, the roof takes shape. These are said to be the largest such arches ever made

Glued-up timbers are also used as vertical supports on each end of the vast roof which is 200 feet long





Kodak's Extra-Fast Film Permits Indoor Action Shots Without Flash

You won't need a costly f:1 lens to take indoor action shots without flash when you use Kodak's Royal Pan film. It has a daylight A.S.A. exposure index of 200, tungsten 160. Exposure for this shot: 1/200 at f:4.7

Air Force Puts Supersonic XF-104 Fighter Through Its Paces



Under flight test at the Edwards Air Force Base is the supersonic XF-104 day fighter. This is not a stripped-down experimental craft, but a fast, highly maneuverable fighter that can climb with amazing speed. The Air Force has not released photographs of the plane. This drawing is an artist's conception based on information which has been published about the "aluminum sliver." Top speed of the plane in level flight is estimated to be about 1000 miles per hour. The slender fuselage has two large air scoops for the Curtiss-Wright J-65 jet engine. Exceptionally short wings measuring only about 28 feet from tip to tip are installed amidship. The tail is set high.

Designed especially for duck hunters, a three-horsepower outboard motor has no highly polished surfaces and is the color of dead marsh grass.

POPULAR MECHANICS

Construction "Pistol" Penetrates Steel Plates

You can drive heavy-shank fasteners into concrete or inch-thick structural-steel plates with a new tool using a gunpowder charge. Pins and studs driven into steel with the gun are said to hold 25 percent better than fasteners seated by other heavy-duty tools. The gun weighs less than eight pounds, can be operated by one hand and drives at the rate of one stud or pin per minute. It uses one of four different powder loads, depending on the job, and is safe to operate.



Rocket-Powered "Pinwheel" Points to "Back Pack" Unit

Something new in simplified air travel was exhibited by the Navy at Glendale, Calif. The "Pinwheel" Rotor-Craft RH-1. The tiny rocket motors built into tips of its rotor blades are fed by flameless liquid-chemical fuel which is transformed into superheated gas. The jets whirl the blades to flying speed in less than 10 seconds. The craft is controlled by a single motorcycle-grip hand throttle. Previously rockets had only two power settings. The objective of the design is to study the possibilities of "back pack" whirlybirds.



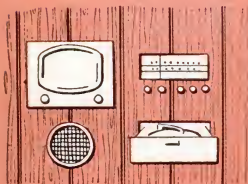
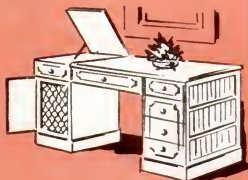
One-Man Navy Helicopter → Tests Stabilizing Controls

It's no good in a rainstorm, but the Navy's Kellett KH-15 helicopter isn't designed for pleasure. The one-man, fresh-air craft is used for studying gyrostabilizing controls for copters. It is rocket powered and has new controls which provide great stability.

Rubber Mixed With Cement Makes Resilient Concrete

Natural rubber latex has been combined with cement to make a new structural product. The material is resilient like rubber and resists corrosion and abrasion, yet has many of the structural qualities of concrete. It can be applied directly to wet or dry surfaces and sticks to plastic, tile, and steel, as well as concrete.





What's All This Talk About

HI-FI?

By Robert Gorman

THAT BIG SOUND sweeping the country is high fidelity—complete with words and music. The music is sweet when you hear it, but some of the words drown out the tune. Everywhere people are talking a gobbledegook language of decibels, inter-modulation distortion, pickup compliance, woofers, tweeters, bass and treble boost.

One of the most startling developments in hi-fi

Lafayette Radio sketches
Electronic Workshop photo



is one that now gives "canned" sound its natural third dimension—space. Already such sound systems are in thousands of homes. A binaural recording uses two tracks, one aimed at your left ear and one at your right. The recording is on twin-track tapes or on records that are played through dual amplifiers and speakers in different parts of the room. A few radio stations broadcast binaurally, using two microphones and transmitters. One mike feeds an FM channel, the other pipes sound to a standard AM outlet. Home listeners using two radios can hear the location of each instrument.

But one ear or two, fidelity is the thing in sound today. Recording artists and engineers pay attention to "room tone"—echoes that give listeners a feeling of space. Padded sound studios are being replaced by "live" halls in which sound bounces around. Other effects that separate and focus individual instruments are added by spotting extra microphones in strategic locations, mixing sounds and by electronic hocus-pocus. At Columbia Records' building in New York, people ride elevators whether they want to or not. Signs on the stair doors read: "Do Not Use Stairway! Reserved as Echo Chamber." RCA Victor engineers have discovered that the tiled men's room of one of their recording halls gives excellent sound bounce.

Skillfully used, such methods add some of the magic of 3-D to canned music, giving it sparkle and realism that old records rarely had. It's all part of a snowballing campaign.

What's all the hi-fi business about? Do you have to learn a new language before you can listen to it? Some of the details are technical but they boil down to this: More and better sound is being broadcast and recorded. It is cleaner, crisper, smoother, more natural and it has an exciting

new third dimension that makes listening more fun. Today's music sounds better on any equipment; it sounds best on hi-fi. Just what is hi-fi?

A high-fidelity system is an arrangement of electronic and mechanical parts that converts electric signals to sound. It starts with a radio tuner or record player—one receives, the other generates signals. The middle section is an amplifier; it soups up the signals and gives them enough "muscle" to operate a loudspeaker. The speaker changes electric impulses to sound waves.

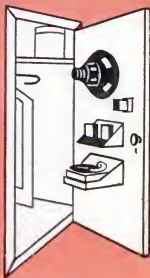
Does the list sound familiar? You find exactly the same parts in every radio-phonograph. The different thing about hi-fi is its quality—achieved by the way it nurses signals and sounds through a series of important changes. To understand this you should know a few simple facts about sound.

Sound waves are vibrations of air that can be measured in frequency, or cycles per second. The ones we hear fall roughly in the band from 50 to 15,000 cycles. Before they are recorded or broadcast, these air vibrations are translated by a microphone into electrical signals. Records are simply sound waves converted to a vibration track on a disk, or magnetic impulses on tape. When played back, the process is reversed from "squiggles" to voltage and, finally, to sound.

A real high-fidelity system must handle the playback without adding to, changing or taking away any important part of the original sound.

That original sound, however, is no simple thing. Every musical note is a cluster of frequencies that includes a pure tone, or fundamental, and an assortment of related frequencies called harmonics or overtones. Harmonics make the difference between a note struck on a piano and the same note "sawed out" on a fiddle. They are sounds

Here are some installation ideas for the hi-fi fan. End table can be fitted with components of his choice





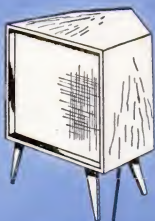
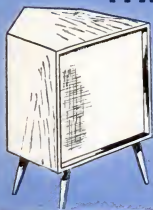
BY RADIO

Two mikes transmit different signals which reach two speakers



THREE-DIMENSIONAL SOUND

Dual arms pick up two different tracks of the record simultaneously. Signals go through an amplifier to speakers on opposite sides of room



BY RECORDING



that give life and individuality to music. Since many of them are in the upper part of the frequency band, one key essential of a hi-fi system is its ability to reproduce the higher frequencies.

By itself, however, the best high-frequency reproduction can be unpleasant. It sounds shrill and harsh unless it is balanced at the other end by low-frequency tones. Hi-fi, therefore, must cover the full range of audible sounds, from the lowest bass to the highest treble overtone.

The weakest link in any sound-reproducing chain is the loudspeaker—the bridge between electricity and sound. To recreate vibrations of air, the diaphragm of the speaker must move in response to the signals it receives. A good speaker has to handle many different sounds at one time without jumbling them together, changing their frequencies or relative loudness, or producing unwanted vibrations. It has to respond to crashing peaks without going into a tailspin and slurring over the next few notes; it must boom like a bass drum and tinkle like a triangle; it must do this smoothly and without noticeable effort.

This is a big assignment for any mechanical device. It takes the most careful design and construction. And even after a speaker has done its job properly, the beautiful sound waves it makes can backfire.

For instance, low-frequency waves fan out. Part of their energy sneaks behind the speaker's cone and cancels new sound-producing vibrations that follow. That's why a speaker needs a "baffle" or enclosure that will prevent back waves from interfering with front ones. If the enclosure isn't large enough, air trapped inside may stiffen the speaker cone and choke off some of the sound.

This affects only the low notes. High-pitched tones create another kind of problem. They beam out so straight that what you hear may depend upon where you sit. A speaker that is hi-fi in front may have poor fidelity when heard from the left or right side.

For a long time this complex speaker problem bottlenecked high fidelity. Old-time fans solved the problem by rigging a room full of speaker boxes. Some purists claim that big boxes are still essential, but others insist that speaker and enclosure developments of the last year or two have revolutionized hi-fi for the average home. Some of today's little boxes give wonderful sound quality. Baffle arrangements with two or more speakers are part of the story. Another part is the speakers themselves. They are more efficient, cleaner sounding. And



Speaker tends to beam high-frequency sounds straight out in narrow band. Bass sounds spread more evenly

there's a whole batch of new design tricks that make those higher frequencies spread out. One new speaker appears to have warts. Little cones pressed into the big one deflect treble tones and diffuse them over a wider area. Other high-frequency speakers have metal diffusion rings or specially shaped horns that serve the same purpose.

Speaker improvements have been more than matched by improvements in other parts of the sound chain—radio tuners, record players and amplifiers—so it is finally possible to assemble components that are hi-fi from beginning to end. In fact, one of the most difficult problems facing the

New RCA speaker has "acoustic domes" which deflect treble tones from tweeter in center





Modern open cabinet holds record player and preamplifier while cabinet at right holds amplifier and speaker

beginner is that of just too much goodness.

If you are in the market for new equipment, your first job is to balance quality against cost. The greatest pitfall facing the average consumer is the tendency to overbuy one part—such as an amplifier—that is too good for the system as a whole. It is possible to buy refinements you can't hear and some that aren't pleasant to your ear.

What kind of sound do you want? How much do you plan to spend? How much quality can you hear? How much is each improvement worth? These are questions only you can answer, but it may help to examine the parts of a high-fidelity system and the way they relate to each other.

Speakers—High-fidelity speakers range in price from about \$20 to well over \$600. Since this is the part you hear, it is a good idea to select it first. Check with a good

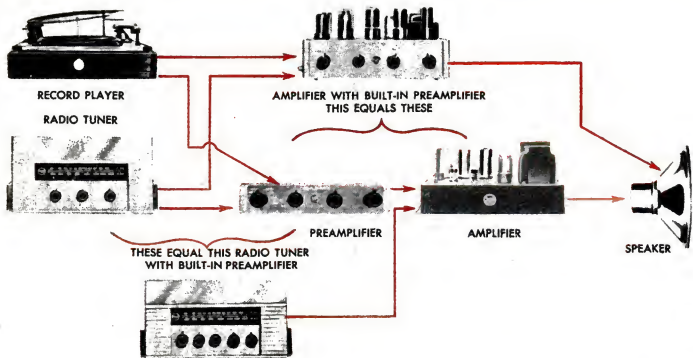
dealer for what your installation will need in the way of angle of sound diffusion, frequency range, uniformity of response (the ability to deliver all frequencies with equal energy) and distortion (a tendency to combine sounds or produce harmonics instead of the frequencies called for).

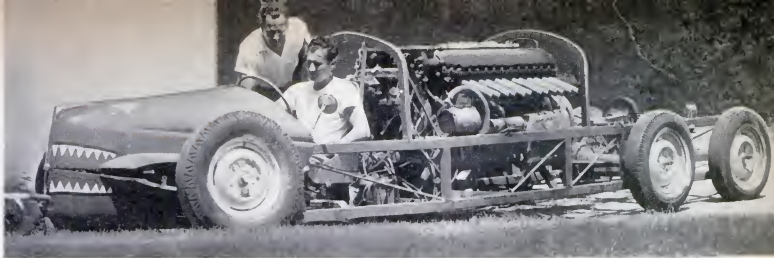
But bear in mind that it is sound, not statistics, that counts. If you possibly can, listen to several speakers before you buy. Make sure that the speakers you are judging are housed in identical boxes or the comparison will tell you little.

Some speakers are built to reproduce all or most of the audible frequencies. It is usually possible to get smoother sound by parceling out the work, using a combination of speakers—a large cone (this is a woofer) to handle the low frequencies plus

(Continued to page 258)

Photo-diagram shows elements of a hi-fi system. Preamplifier may be separate or built into another unit





Monster's engine, taken from a fighter plane, is mounted behind driver. Car has a wheelbase of 17 feet

Fastest Drag Racer?

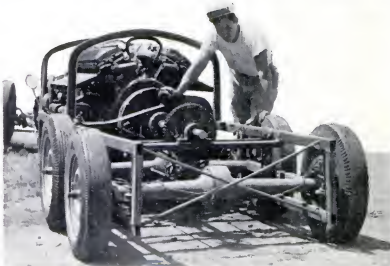
A STRANGE CAR that seems to be all wheels and power plant roared down a section of highway near Akron, Ohio, a few weeks ago to set what is believed to be a new world's drag-race record. From a standing start, the hot rod accelerated to 145.16 miles per hour in a run of $\frac{1}{4}$ mile.

Parts from airplanes, Army tanks and automobiles went into the 20-foot-long car named "Green Monster No. 2." It was built by Arthur and Walter Arfons.

The power plant, mounted behind the driver, is an Allison V12 engine from a P-51 fighter plane. The Arfons brothers estimate it develops 2000 horsepower at the 4000-r.p.m. rate at which they run it. The power is transmitted through a hydraulically operated clutch taken from a 30-ton tank, and a chain drive to two rear axles mounting four drive wheels. The brothers use the unusual tandem-wheel drive for better traction. They estimate the top speed of the car at 270 miles per hour, but in recent runs the tires began to smoke as the speed approached 150 miles per hour. Acceleration has been estimated at 0 to 140 miles per hour in eight seconds.



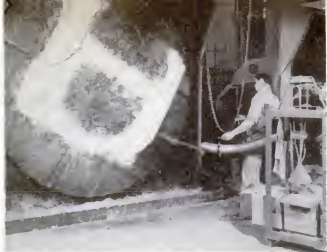
Projecting from the Monster's savage mouth is an air-speed indicator tube. It takes the place of an ordinary speedometer



Tandem-wheel drive increases the traction and minimizes the tendency to "fishtail." Car has a clutch from a 30-ton tank

Monster recently accelerated to 145.16 miles per hour in $\frac{1}{4}$ -mile run. Top speed may be 270 miles per hour





Glass fiber is sprayed over perforated screen as it rotates. Suction from back holds fibers in position

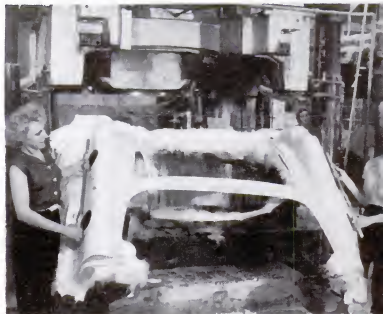


When removed from screen, preform resembles fluffy blanket. But fender and headlight bulges are evident

GLASS BLANKETS BECOME A CORVETTE BODY



Preform is placed between dies in press, saturated with resinous liquid and stamped under pressure



Stamped part is removed from press after two-to-seven-minute application of steam heat and pressure

WHEN THE FIRST Corvettes were being made, curing major sections of the glass-fiber body took up to 24 hours. Now it's done in a few minutes by improved, mass-production techniques. Birthplace of a Corvette body section is a circular metal screen that carries a mold of the part. As the screen rotates, a worker funnels chopped glass fiber in the direction of the mold. A powerful suction behind the screen draws and holds the fibers in place while a light spray of resin adds a bond. When the "preform," as it's called, is complete, a shield is lowered over the screen and heat stiffens the resin-coated mass. The preform is placed between the dies in a press and the fibers saturated with a resinous liquid. To give a smooth finish, a veil of finely woven fiber glass is superimposed and the part compressed under 120 pounds per square inch. Steam is forced through the hollow dies to raise their temperature to 220 degrees. After a curing time of from two to seven minutes, the now-rigid form is removed from the press and excess fiber cut away. Later it is joined to other body parts by welding or riveting.

Large piece in foreground is front-fender section that was formed in the four steps shown above. It has been trimmed and the cowl added. Seen here are main body parts





Graceful leap of the cougar is stopped in mid-air by the cameraman to show muscles of its powerful body

Walt Disney's cameramen spent months filming wildlife on the Western plains for the new film, *The Vanishing Prairie*. Here is the story of one of the Disney crew:



A prairie dog signals "all clear" after danger passes

ANIMALS ARE LIKE OTHER PEOPLE

By Tom McHugh

NO HOLLYWOOD STAR could be as temperamental, as hilarious, as touching or as frightening as some of the actors that have performed their roles before my camera.

As a member of the Walt Disney wildlife camera crew, I spent two seasons filming the spectacular true-life adventure, *The Vanishing Prairie*. We followed and found our animal and bird actors in remote sections of the West—in the last retreats of the native wildlife of the Great Plains.

This was my greatest camera adventure.

My "actors" were unpredictable. They misbehaved continually. Small ones disappeared down burrows just when I was ready to start my camera. Of course they ran from me whenever I inadvertently revealed myself. They hid from me much more easily than I from them. Larger ones often charged me angrily when I got too close.

Yet all this was to be expected.

The story for this film was their story—the everyday adventures of the animals and birds of the vast American prairie. They wrote the script with nature as their director. My camera was merely the "invisible" intruder.

In spite of the fact that the "actors" were animals, Disney



demanding that this feature have many of the qualities of other features. There had to be humor, emotion, drama and struggles.

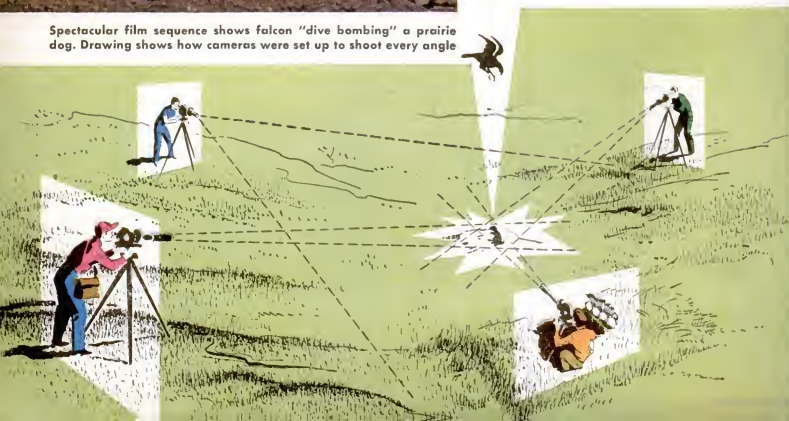
The big difference from most movies, however, was that all these animal adventures were truth and not fiction. Yet truth in the animal world is as fascinating and entertaining as any fiction. *The Vanishing Prairie* tells the problems of the animal actors as they perform naturally on this prairie stage. It is much more than a disjointed assembly of beautiful wildlife pictures.

For example, prairie dogs fight ceaselessly against their unwanted neighbors. First a pair of burrowing owls usurps a section of the dog's burrow to raise a family. Then a badger disrupts life by chasing the dog into his burrow and trying to dig him out. The dog outsmarts the badger by moving through his underground home and emerging from another entrance to watch the badger dig.

But this dog becomes so intent upon watching the badger that he fails to see a coyote stalking from behind. When the coyote corners him he puts up such a bewildering defense of tooth and claw that the coyote hesitates. And the coyote who hesitates loses his prairie dog.

The mesh of life in a prairie-dog town continues. Animals that first looked like unwanted visitors soon appear in a different light when a rattlesnake in-

Spectacular film sequence shows falcon "dive bombing" a prairie dog. Drawing shows how cameras were set up to shoot every angle





Little snowplane carried author McHugh, right, and cameraman James Simon into snowbound Yellowstone

vades the prairie-dog area. The owls bluff it away and the coyote moves in to kill it.

Many intimate close-ups help carry a story like this. These are the most difficult parts of wildlife photography. To get them I used 16-power telephoto lenses, stalked creatures by creeping along on hands and knees under cover of low foliage, built blinds to camouflage myself and my camera and used remote camera control by electric wires or radio.

Intimate close-ups bring out the personality in animals. When you compare their personalities with those of people you know, you understand and sympathize with their problems better. Animals with human traits, such as anger or foolishness, are amusing.

A group of prairie dogs has as great a range of personality as any group of humans. There is the fat dog that can't stand up on its hind legs without tipping over backwards. There is the vain dog who constantly takes dust baths to spruce up her fur. There is the tough-looking, battle-scarred man of the home and his harem of coy wives.

The most dramatic angle for photographing these animal personalities is to substitute the camera in place of one animal. The camera sees another prairie dog or a buffalo just as a prairie dog sees it—from a height of six inches



After penetrating the depths of Yellowstone in winter, the cameramen photographed buffalo standing almost belly-deep in the snow. Below, in one film sequence a prairie dog wanders too far from his burrow and has to defend himself with teeth and claw against a coyote. Eventually the coyote backed away





Clever photographers managed to film a cutaway view of the life inside an underground prairie-dog town

above the ground. An attacking prairie falcon—and the camera—sees his prey while swooshing toward it just above the ground.

The camera itself can be adjusted mechanically to best portray other sequences. Speed up the camera to 64 or 128 frames per second for a slow-motion effect. This is good for animals with unusual or irregular patterns of action. It gives a speed analysis of the graceful leap of a cougar, the hops and bounces of a jack rabbit, the booming air sacs of a sage cock or the pro-

gression of the shock wave through the bodies of colliding bighorn rams.

Slow down the camera to create just the opposite effect. By taking only one frame every few seconds, you speed action considerably on the screen. Static scenes spring to life. The clouds of a sunset bubble about and then darken in seconds on the screen. Or a prairie thundercloud explodes in moments.

Cameras should be used only during the brightest sunlight of the day according to the color-film manufacturers. Yet wildlife



Cameraman-author McHugh, camouflaged under a real buffalo robe, attempts to sidle slowly up to a wary buffalo



Like humans, prairie dogs work and play well together, but occasionally get into a rather serious scrap

doesn't always heed this rule. In fact, early morning and late evening are periods of greater activity.

The Vanishing Prairie contains many shots taken under such extreme conditions. There is even a scene of a cluster of sage grouse on their booming ground taken just before dawn with the moon in the picture. Such shots have a reddish or bluish cast due to the off-color light at these odd hours. These hues add a wonderful mood which ordinary bright daylight lacks.

Prairie chickens tested our use of weak light beyond the limit, however. They danced their best courtship displays before the light was bright enough for pictures, all the while uttering an eerie, booming sound. Activity dropped off when the sun came

up. Somehow, we would have to tempt them to dance in light that was bright enough for the cameras.

A portable phonograph solved this problem. As the sounds of booming prairie chickens streamed forth from our blind one bright morning, the birds began to cock their heads. Perhaps they thought, "Listen! Other chickens are dancing and booming—why shouldn't we start again?" And they did, to give us some wonderful shots in good sunlight.

The prairie chickens were guinea pigs for other experiments. On some mornings the best activity was too far from the blind for good pictures. That indicated a need for a "blind sneak." Cameras were first hung from hooks on the roof of the blind.

Where's the photographer? Cameramen found they virtually had to live with the herd to get top-notch films





Young owl, raised in a prairie-dog home which his mother usurped, tries to bluff away the former homeowner



Camouflaged camera was placed in path of buffalo stampede and touched off by radio. Below, in another setup, lead buffalo broke string to start camera

I then lifted the blind slowly from the ground and began walking with it to the center of action, being careful all the time to avoid bumping into birds. The cocks were so engrossed in their dancing that they seldom flushed when the blind crept past them!

Luck is a wonderful thing in wildlife photography. I only regret that it doesn't occur as often as most observers think.

Many people remarked after viewing *The Vanishing Prairie*, "Wasn't that cameraman lucky to get that comical shot of a newborn buffalo doing a backward somersault!"

In a way, it was luck—luck that I found a cow with a newborn calf. But that's where the luck ended. The key to this shot was *anticipation*. I expected that the new calf would make a spectacle of standing up for the first time. I held the camera on that calf continually, changing focus and lens





Photographer creeps up on grouse and prairie chicken under cover of a "sneak blind." Right, sage grouse cock inflates air sacs to show off for his girl friends



opening when necessary. My arm began to get tired and my eyes were straining through the viewer but I still kept the camera glued to the calf. When the big moment came, I was completely ready. A push of the shutter release and the scene was mine.

Anticipation sometimes devours film very rapidly. Prairie dogs gave little warning when they were going to "salaam" as an all-clear signal after a falcon raid. Yet we had to have this action for the film. The only solution was to start the camera when there were indications of such actions happening. And the unexpected or unpredictable did happen at some times when the camera was running.

One result of this was a great surplus of film, more than 70 times as much as could be used in the final picture. Such a surplus allowed the Disney staff to choose only the gems of action.

The Vanishing Prairie closely merges unusual wildlife with the most romantic era in American history, the settlement of the West. To get some of these animal shots we also had to pioneer expeditions into wilderness areas.

For winter scenes of buffalo, Jim Simon and I organized an expedition of two snowplanes—little propeller-driven vehicles that scoot along the snow on skis—to explore snowbound Yellowstone Park. Veteran pilots Harry Brown and Holly Leek

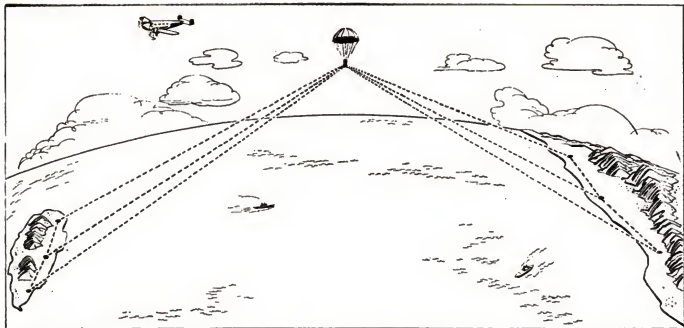
moved their planes to the park for this trip.

There were too many times on this jaunt when it looked as though we were doomed to walk out on snowshoes without any pictures at all.

Take the first day, for example. The 40-mile trip from West Yellowstone to Canyon was supposed to take less than two hours, until we discovered the effect of Yellowstone's thermal areas. The park is noted for its numerous geysers, but "hot spots" which melted the snow from the road were equally abundant. Our ski planes ground to a stop on these areas of bare pavement—skis were about as useful here as a motorboat on land. We then had to lift up each ski, put a caster underneath and slowly maneuver the plane across the bare spot.

We also ran into sticky snow on hills. Harry gunned the motor but the plane wouldn't budge. In this emergency we had

(Continued to page 232)



Surveyors Who Pin-Point Land Areas Have a "Flare" for Their Jobs

Geodetic surveyors have a bright new tool to measure the world. These men who make the surveys that accurately locate states, countries, islands and continents, now are using aerial flares to pin-point areas never before accessible.

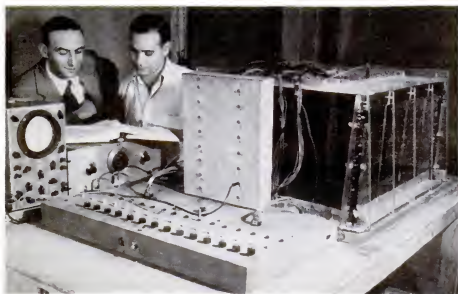
The surveyors work at night. Two or more groups set up highly precise transits called theodolites at key points of an area to be measured. The instruments may be as much as 50 miles apart with any kind of terrain—ocean, desert, icecap or jungle—between them. An airplane flies to a central point and drops a brilliant parachute flare, one of at least a million candlepower. As the flare slowly descends, a man in the plane alerts the surveyors by radio to train the telescopes of their instruments on what to them is a distant tiny light. The man in the plane then pushes a button on the trans-

mitter. That's all there is to the process.

Each of the theodolites on the ground contains a robot camera that records on film the exact angle of each surveyor's sighting on the flare. All the cameras record their readings at the same instant. The final calculations, as in all geodetic surveying, are done in an office where other factors such as the varying curvature of the earth at different latitudes can also be considered. The precision of the process is so great that the final angles recorded by the instruments are obtained by viewing the film through a laboratory microscope equipped with a micrometer.

The method can be used to locate an island that is over the horizon from the shore. Previously such a measurement could be made only roughly with devices similar to a ship's navigating instruments.

Electric Wind Tunnel Speeds Tests of Airplane Wings

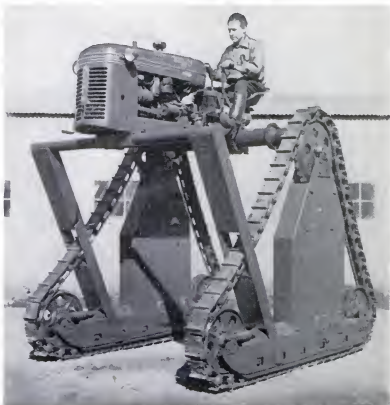


Cornell University photo

By means of an "electric wind tunnel," researchers can now determine how forces act on an airplane wing in a fraction of the time it takes in a conventional wind tunnel or by computational methods. Built at Cornell University, the new device simulates the flow of air by passing electricity through liquid. It can quickly provide engineers with an extremely accurate lift pattern for any wing shape and any subsonic speed.

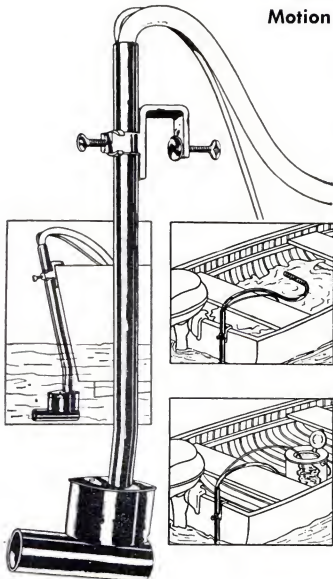
Tractor Mounted on "Stilts" Is Used to Dust and Detassel Corn

Moving slowly through the sweet-corn fields of California is a weird tractor on stilts. The tractor is used to dust and detassel the high corn. The builder started with a 21-horsepower crawler tractor. He raised the tractor chassis including the motor and transmission so there would be 78 inches of clearance beneath it. Side frames—the "stilts"—support the tractor in this position. Additional sprockets and links of track were installed on each side. The result is a tractor that rolls through the high corn, dusting and detasseling it even during wet weather when rubber-tired tractors bog down in the mud. It has 6½ feet clearance and straddles two rows of corn while dusting 12. A framework across the back holds the dusting equipment. During detasseling, men ride on hangers dropped down between the rows alongside the tractor.



Motion of Boat Operates Automatic Bailer

As long as a boat is in motion a new bailer keeps it dry. The automatic bailer is a tube which operates on the Venturi principle to suck the water out of the boat. The tube clamps to the boat, with one end in the water and the other in the bottom of the craft. Whenever the boat is in motion, any water in the bottom moves up the tube and over the side. Another tube attached to the bailer brings fresh water from the lake or river into the minnow pail to keep bait alive longer.



Liquid Added to Can of Paint Prevents Formation of Skin

One tablespoonful of a colorless liquid in a quart of paint prevents the formation of skin and lumps during storage. By halting the oxidation and consequent drying of important oils, the chemical maintains the quality of the paint. It also retards the settling of pigments; thus paint for touch-ups retains its original color. The chemical, which in addition can be used to keep putty and calking compounds smooth and ready for use, evaporates when the paint is applied and leaves no residue.

Information not listed on articles in the index frequently is listed in the WHERE-TO-FIND-IT LIST, free to readers from the Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11

The OWNERS REPORT:



Owners are the real test drivers. They know the good and the bad features of their cars. We asked 1000 Cadillac owners to tell you about the 1954 models. Here is their story

WHY DID THEY BUY A CADILLAC?

"Economical on gas and repairs."

*Provo, Utah,
professor*



"High resale value and economical operation."

*Laramie, Wyo.,
attorney*



"My wife wanted a Cadillac."

*Crescent City, Calif.,
merchant*



"I always hoped to own one. My greatest ambition."

*La Crosse, Wis.,
business man*



"Better performance."

*Albany, N. Y.,
salesman*



"Wonderfully low depreciation."

*Newbury, Ohio,
consultant*



"Just like to impress people."

*Oakwood, Va.,
businessman*



"Prestige and to show off."

*Daly City, Calif.,
investor*





Lights indicate oil pressure and amperes. The word "brake" warns driver he has not released hand brake



White card in front of radiator is a Cadillac "extra." On it is printed name and address of the car's owner

OWNERS SAY THEY LIKE CADILLAC'S COMFORT, POWER AND PRESTIGE

By Cadillac Owners

WHAT'S THE MAGIC of Cadillac? Why is it the prestige car it is? A thousand Cadillac owners were asked to explain.

But even owners could come to no definite conclusion. Owners are aware of the prestige value of their cars, but none could explain it. Price alone is not the answer because other cars cost as much or more.

"It carries a lot of prestige to own a new Cadillac each year."—Daly City, Calif., investor.

"I always hoped to own one. My greatest ambition."—La Crosse, Wis., businessman.

"I bought Cadillac because of the name."

—Chicago, Ill., certified public accountant.

"I just like to impress people."—Oakwood, Va., businessman.

"Every Tom, Dick and Harry hasn't got one."—Mason, Mich., factory mechanic.

Even those owners who have had trouble with their Cadillacs still maintain a great admiration for the car.

"I realize from all viewpoints, it is the finest for the money. Thus far, I had my hood, rear door, trunk lid and front fender refinished. Have had trouble getting engine to start. Steering gear had to be gone over."—Chicago, Ill., warehouseman.

Strangely enough, economy is mentioned

Clymer Tests the Cadillac

By Floyd Clymer

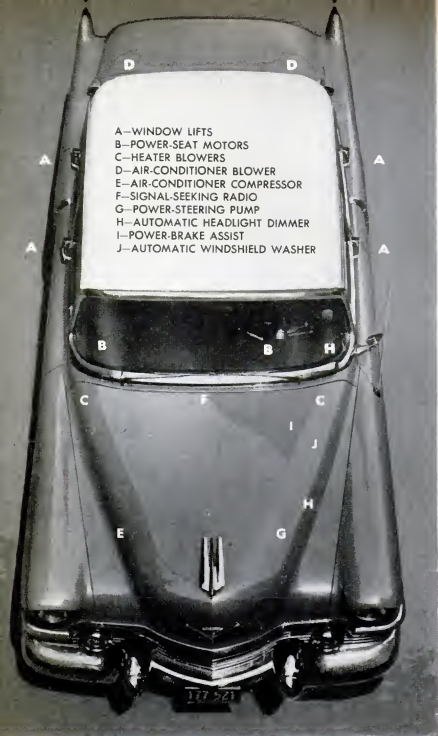
MY ROAD TEST covered about 340 miles in the Rockies around Denver and about 220 miles in Southern California—a total of 560 miles. Two Series 62 sedans were put through tests under conditions ranging from high altitudes of the Rockies to the heat of the Mojave Desert.

The 1954 Cadillac is improved over the previous models and, for a big car, handling qualities are excellent.

Cadillac has been noted for economy despite its size and the 1954 model is no exception. The overhead-valve V8 engine provides smooth, effortless power at all

(Continued to page 234)





For a price, these magical "gremlins" will take the work and discomfort out of driving. Power steering is now standard

Cadillac pipes heated air into the rear seat via a duct in each front door. When the door is closed, the outlet is behind the front seat. Sketch at right shows details of system



as one reason why owners think so highly of their Cadillacs.

"Cheapest over-all operation."—Greenville, Ill., owner.

"It is economical for gas and repairs."—Provo, Utah, professor.

"High resale value."—Laramie, Wyo., attorney.

Probably the following owner came closest to describing the Cadillac appeal:

"You are satisfied when you drive the Cadillac." — Portland, Ore., manufacturer.

Best-Liked Features

Riding comfort is the best-liked feature of the 1954 Cadillac, according to owners. Performance and power are right behind.

"Easy riding qualities. Excellent for trips, a fine family car."—Oxnard, Calif., chiropractor.

"It rides like floating on air."—Chicago, Ill., businessman.

"I like the higher seating which gives me better visibility. The ease of all controls. The power steering and brakes."—New Brunswick, N. J., merchant.

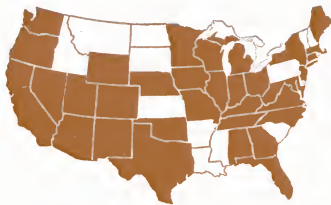
"Riding qualities are wonderful."—Buffalo, N. Y., business executive.

"Engine is economical as well as powerful."—Antioch, Calif., plant manager.

"This car can really go in fine shape for mile after mile with a minimum of repair. A great performer!"—Minneapolis, Minn., salesman.

Third among the best-liked features was the ease of handling. All Cadillacs for 1954 have power steering as standard equipment and this makes steering effortless. Fourth in popularity was Cadillac's styling and appearance.





Cadillac owners from 34 states (shown in color on the map) tell you about their cars in the PM poll

Percentages from PM Poll of 1954 Cadillac Owners

OVER-ALL RATING OF THE CADILLAC

Excellent	71%
Good	21%
Fair	5%
Poor	3%

Previous Cadillac owners	83%
Owners of 5 or more Cadillacs previously	30%

Owners who have 2 or more cars

Make of the "second" car:	
Cadillac	26%
Ford	15%
Chevrolet	14%
Oldsmobile	11%
Others	34%

Owners' rate dealer service:	
Excellent	45%
Good	26%
Fair	19%
Poor	10%

Would buy another Cadillac?	
Yes	85%
Might	12%
No	3%

Tried other makes before buying Cadillac:	
Did try other makes	45%
Did not try other makes	49%
No comment	6%

Owners' opinion of engine:	
Excellent	89%
Good	11%
Poor	0%

Owners' opinion of wrap-around windshield:	
Excellent	73%
Good	22%
Poor	5%

Owners' opinion of rear fender fins:	
Like	90%
Dislike	7%
No comment	3%

Owners' opinion of front grille unit:	
Like	65%
Dislike	28%
No comment	7%

Owners' opinion of overall length:	
Like	88%
Dislike	11%
No comment	1%

Owners' opinion of body styling:	
Like	90%
Dislike	6%
No comment	4%

Average miles per gallon	
City driving	13.9 m.p.g.
Country driving	16.7 m.p.g.

Roadability	
Excellent	82%
Good	16%
Poor	2%

Handling	
Excellent	88%
Good	12%
Poor	0%

Structural rigidity	
Excellent	62%
Good	28%
Poor	10%

Acceleration from zero	
Excellent	72%
Good	24%
Poor	4%

Acceleration from 50 m.p.h.	
Excellent	73%
Good	26%
Poor	1%

Who are the Cadillac owners?	
Owners of a business	33%
Business executives	20%
Professional persons	14%
Salesmen	7%
Retired	6%
Not given	6%
Miscellaneous	14%

BEST-LIKED FEATURES	
Riding comfort	35%
Performance and power	31%
Handling ease	27%
Styling	24%
Economy of operation	11%
* Power steering standard on all 1954 Cadillacs	

MOST-FREQUENT COMPLAINTS	
Poor assembly work	19%
Rattles and squeaks	18%
Gasoline fumes inside car	9%
Poor paint job	7%
Excessive wind noise	6%

Owners with no complaints at all	33%
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"I like best the ease of handling on the road which does not tire you on long trips."—Omaha, Neb., broker.

"Distinctive, smart styling. Modern yet not overdone. Plenty of legroom."—Somerset, Ky., photographer.

"Beautiful lines with no danger of it being 'dated' by the next model."—Chippewa Falls, Wis., businessman.

However, some owners disagree with the 24 percent who said styling was among the best-liked features.

"Bulky and unattractive."—Chevy Chase, Md., executive.

"Too much gingerbread on front grille. Too much overhang beyond rear wheels."—Chicago executive.

Cadillac Owners Complain Also

Although most are convinced they drive the prestige car, Cadillac owners have complaints just like all owners.

By a wide margin, the two most frequent complaints were (1) poor assembly work at

the factory, and (2) rattles and squeaks.

"Factory inspection very bad. Had paint bubbles, unfinished in spots. Directional signals faulty. Odometer not accurate. Steering wheel not properly lined up. However, dealer is gradually getting everything in order."—Fair Haven, N. J., executive.

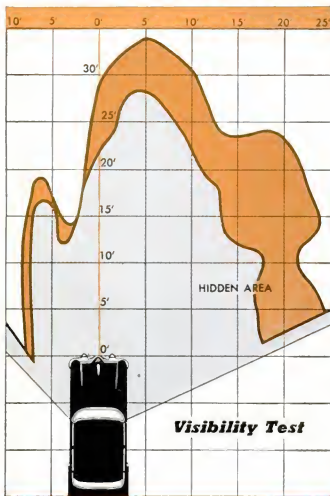
"Sloppy job of inspection. Upholstery not good for a custom car. Bad paint job. Car was repainted at 2000 miles."—Glen-coe, Ill., executive.

"Quality-control inspection poor. Chrome not too good. Back bumper had to be changed. Paint applied too sloppy."—Panama City, Fla., Air Force officer.

"Too little time given to details or inspection. At 600 miles speedometer failed. At 1000 miles Hydra-Matic had to be replaced. At 3000 miles generator went bad and had to be replaced."—Peekskill, N. Y., dentist.

"Doors on my convertible are terrible. Either rattle or won't open."—Richmond, Va., scientist.

"Body rattles very bad. Leaks around



With four-way front seat in highest position, driver can't see gray area. With seat all the way down, yellow area is also invisible to him

Acceleration Test

1954 CADILLAC 62 FOUR-DOOR SEDAN
with Hydra-Matic

¼ mile from zero

½ mile from zero

0 to 30 m.p.h.

0 to 60 m.p.h.

Top speed by speedometer.....115 m.p.h.
Actual top speed about 5% less

Economy Test

MILES PER GALLON
Constant-Speed Mileage

At constant 30 m.p.h.	22.2
At constant 50 m.p.h.	18.1
At constant 60 m.p.h.	15.9
At constant 75 m.p.h.	11.8

Cross-Country Mileage

Denver to Estes Park and Grand Lake, returning by Lookout Mountain (altitudes from 5280 ft. to 13,000 ft.)	13.2
Denver to Cheyenne, Wya., returning via Julesburg, Colo., (open spaces, little traffic)	17.4
Los Angeles to Barstow and return via Mojave Desert	17.1

(Premium gasoline used)

doors so bad you have to keep rubber sheeting on seat. Dealer very cooperative."—Lewiston, Me., accountant.

"Doors fit badly. Rattle. I have had to have rubber in both doors to prevent noise."—Lincoln, Me., physician.

Also mentioned by the owners is an annoying odor of gasoline inside the car.

"Raw gas smell. Many other annoyances; Radio stopped four times; taillight out three times; directional lights failed two times."—Hartsdale, N. Y., housewife.

"New car had one bad bug: Gas tank was not properly vented and gas fumes got into car. Has been fixed."—Galesburg, Ill., executive.

"Some gasoline fumes leak into inside of car through space where filler neck passes through trunk."—Houston, Tex., rancher.

Another complaint, although not so frequently mentioned, was wind noise at high speeds.

"Windshield causes wind noise at 50 miles per hour on my Coupe de Ville."—Birmingham, Ala., executive.

Reputation for Economy

Cadillac has built up a reputation for economy of operation and, as previously mentioned, some owners list this as the reason why they bought the car. However, there seems to be some dissension among owners about this fact.

"I have often wondered where the Cadillacs are that get such good gas mileage. I have never gotten more than 12.5 miles per gallon around town and 16.5 on the road, driving fairly conservatively, too."—Atlanta, Ga., real-estate owner.

"I get 10 miles per gallon in city and 12 miles per gallon in country driving. My 1949 Cadillac provided superior economy."—Reynolds, N. C., retired owner.

Cadillacs have had a very low annual depreciation since the war, another economy factor. There is some indication that this is changing.

"We traded a 1950 for a 1951 for about \$500 depreciation. Each year it has cost me more to trade. My last trade was a '53 for this '54, same model and same equipment. Cost me about \$1600."—Somerville, Tenn., merchant.

But there can be no doubt but that Cadillac owners believe they drive the outstanding automobile. Nearly half of them (49 percent) admitted that they did not even try any other make before buying Cadillac. And these owners could buy any make as they don't have to limit their choice to any price class for economy reasons.

One third of them (33 percent) did not list a single complaint.

Who are the Cadillac owners? More than

(Continued to page 240)

Silage Blower Vacuums Golf Greens Covered With Layer of Silt

Ingenuity and a vacuum silage blower solved the problem of removing a heavy layer of silt that threatened to kill the grass on the greens of the Garden City, Kans., Country Club. A severe storm deposited the silt, inches deep, on the greens. A vacuum silage blower was borrowed from a local farm and two nine-horsepower motors rigged to it. The large-scale vacuuming was done as the silt was sucked up through its flexible pipe and then exhausted.



Lifeboat Engine Runs Under Water

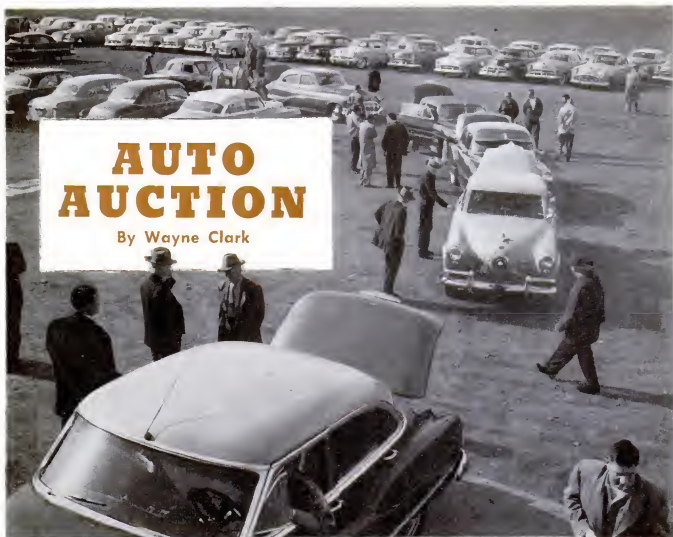
Even when it's covered with water, a new lifeboat engine keeps chugging. The diesel engine is also its own bailer and can be started or stopped while submerged. It was recently demonstrated in New York. The water-proof engine is only the latest in a long list of products designed for lifeboat use. These include radios, water distillers and fishing equipment.

Floating Mower Cuts Canal Weeds

Weeds and water plants which slow navigation in the canals of Holland are cut by a boat-mounted mower. The rig has two cutting bars, one at the bow to make an initial cut in dense growth, the other at the stern. Both are driven by a motor. Weeds are mowed down as the boat moves along.

Should a ship's aerial be shot away, disconnected or otherwise damaged, the transmitter of a new type of ship's radio-telephone developed in England remains unaffected.





AUTO AUCTION

By Wayne Clark

Cars move into the auction hall as prospective buyers take a final look before going in for the bidding

AUCTIONEERS SOUND the same whether they're selling tobacco or automobiles. Little known by the public, auto auctions all over the nation are setting prices of used cars—determining in large measure what your family “hack” is worth.

The automobile auction gives the new-car dealer a chance to get rid of surplus trade-ins or, in some cases, to get rid of surplus new cars (an activity frowned on as “bootlegging”). It enables the used-car dealer to get cars that he knows he can sell. At the auction he selects the makes and models that are wanted by his customers.

When a car comes in for auction, it is first registered and then parked with other cars of the same year and make. The title is held in trust by the auction house until the sale. Titles are guaranteed and have to be checked to make certain the car has not been stolen.

Only dealers can bid, although they may bring guests. Used-car buyers are shrewd. They have to be or they will soon go broke. A few bad buys and the year's profits are wiped out. The buyers inspect the cars, checking everything. In the lot before the car goes on the block is where the buyer makes up his mind. He checks the trunk

to make sure there are no telltale holes where a taxicab radio might have been. He starts the engine, backs the car up. He lifts the hood to be certain an oversize generator doesn't give away a record as a police car.

If his inspection convinces him it's a car he wants, he jots down the registration number that's on the windshield and puts down what he thinks is the top price he should bid when the car comes up.

Should he make the top bid on the car, some auctions permit him to test drive the car briefly. Most auctions guarantee the cars they sell if they go for more than a certain minimum price. The guarantee states that the rear end, transmission and block are in good condition. It lasts only until the dealer gets the car to his lot—from then on it's his worry.

Cars go on the block in order of age—the oldest cars first. As the car is driven in, the trunk is opened to show how clean it is and what the spare tire looks like. Doors and hood are opened. But the buyers do little inspecting now—they have done all of it earlier out in the parking lot.

The auctioneer begins his sing-song. Pit men “drum up” the bids and relay them to the auctioneer, slapping fenders, opening



Photos courtesy Dyer, Ind., Auto Auction

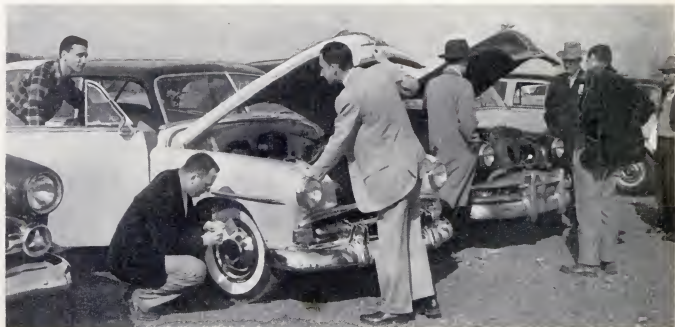
Buyers cluster around as the auctioneer keeps bidding going. It is fast, taking about two minutes per car

and closing doors to punctuate their activities. The dealer who is selling the car is permitted to enter the bidding to protect his interest. If he thinks the bid is too low, he buys the car himself.

Prices for any given year and make may vary as much as \$300, depending upon the

condition of the car. To describe that condition, the trade has its own set of adjectives. From top quality on down, they are as follows: New, sharp, good, fair and rough. New means just what it says—never been used. And, as the buyers know, rough is really rough! ★ ★ ★

Three used-car dealers look over a 1952 Plymouth. Buyers go over each car carefully before it goes on block





WHAT'S NEW FOR Your Home

1

1. FREEZER for small apartments is also a drop-leaf kitchen table. Unit has six-cubic-foot capacity, pedal opener, swing door and smooth-rolling food file drawers



2

2. CONTROL switches house lights on when darkness comes, fools burglars. Lamp to be controlled is plugged into the photoelectric unit, which is placed or mounted by window



3

3. ROCKER SPRINGS for crib take place of casters, turn bed into cradle. Electric motor (inset) automatically rocks crib. Timer shuts off the rocker at a predetermined time

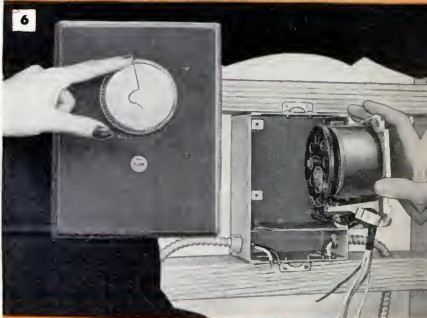




4. WATER PURIFIER attached to plumbing is designed to make any water safe and pleasant to drink. Chemical cartridge is replaced twice yearly. Unit removes dirt, bad tastes, bacteria



5. AIR CLEANER filters with electrically charged plates. Dust, smoke, pollen and lint are removed as the air rushes through. Unit, designed for home use, aids allergy sufferers



6. DIMMER replaces wall switch, provides an infinite range of light from blackout to full illumination. Transformer unit lets you select best light for reading, conversation or TV

7. CONVERTIBLE BED folds into a compact seat for daytime use. Bed, which measures 31 by 76 inches, has full innerspring mattress. Decorative cover conceals folded bed by day





Trailer is towed to safe site and radio antennas erected. Transmitters then relay civil-defense messages

Trailers Packed With Radios Aid Civil Defense in Los Angeles

Los Angeles now has three truck trailers packed with radios and other communication equipment. The units, costing \$40,000 each, serve as mobile communication centers for the city's civil-defense system. In each trailer are six receiving and transmitting sets, plus a master communication set. They provide contact with 36 fixed communication centers. In an emergency, the trailers can be hauled to any location and antennas for the equipment set up quickly. Any one of the trailers can function as the base unit.



Photographic "North Light" Uses 140 Automobile Headlight Bulbs



Artificial "north light" for taking photographs with faint shadows consists of 140 old-style six-volt automobile headlamp bulbs mounted on a rectangular panel. The lamps are wired in seven parallel lines of 20 bulbs each, thus operating directly on 120-volt house current. Color temperature of the lights is controlled by a set-up transformer.

Ⓒ In its first year of operation, the MATS Pacific Airlift ferried some 91,500 passengers and more than 20,600 tons of cargo from America to the Far East.



FAST HORSES AND **SHORT ROPES**

By Willard H. Porter

Add a cowboy's skill and you have the formula for a big business, Western style—calf roping

THE BAY HORSE Jess, one of the best mounts on the rodeo circuit, quivered, his muscles hard and knotted, as his rider backed him into the starting box beside the chute. Then the cowboy, rope held ready in his right hand, nodded to the man at the chute gate. The gate opened and a fast Brahman calf bolted into the arena. On a cue from his rider the bay horse broke from the box like a spring. With terrific speed he overtook the calf.

Hushed and expectant, the big Fort Worth rodeo crowd watched Gene Rambo, great all-around cowboy of Shandon, Calif., ride to his last calf. He was in a good position to win the two-calf-average prize money if he could tie this one in 18.3 seconds or better.

Rambo threw his rope like a rock. As the loop settled neatly over the calf's head the horse jabbed all four legs into the arena turf and stopped. Rambo dismounted on the run and quickly threw the calf. He jerked the piggin' string from between his teeth and popped it around a foreleg. He gathered the kicking calf's two hind legs over one foreleg. His hands blurred as he speed-tied. Three wraps and a half hitch! His arms slashed upwards to signal he was through.

No one said a word. It had been good time, all right.

Here's the champion of all roping horses, Baldy, now retired





Copyright by Matt Culley

Perfect loop tossed by roper Asbury Schell drops over the calf's head. As soon as Schell tightens the loop, his horse will dig in for a lightning stop

But just how good? Then the loudspeaker blared.

"Gene Rambo's time on his second and last calf," the announcer said, pausing for effect, "was 16.4 seconds." For his half-minute's work—he secured his first calf in 13.8—Rambo won Fort Worth's 1950 calf-roping championship plus a check for \$2500.

Watching top-drawer ropers perform like this is fun. I have seen them all—the make-believe, the good and, like Rambo, the really outstanding.

To me, professional calf roping is one of the most spectacular sports in the world. The men who make a living at it are the greatest athletes in the West. They have to be for, of all the rodeo events, roping calves is the most popular and competitive. Four years ago at Fort Worth, when Rambo won, 110 ropers had each paid an entrance fee

Practice can cut a split second off a roper's time. Here Del Haverly rehearses every move while he pins the calf with his knees. Three legs of the calf must be tied with the rope





Lynn Sheppard leaps from the saddle as his horse puts on the brakes. Horse will keep rope taut while Sheppard throws the calf

of \$150 to rope two calves. They were the best in the business.

Before a man can ever become a consistent money-winner he must gain confidence in himself. If he's sure of himself and of what he's doing he's well on his way to the pay window.

The late Clyde Burk of Comanche, Okla., a young cowboy who was killed hazing a bulldogging steer at Denver in 1945, was extremely self-confident, a factor which contributed greatly to his financial success as a roper. Once at an Oklahoma rodeo Burk's turn in the calf roping was delayed for minor chute repairs. As he waited for his calf, walking his horse up and down in front of the box, a friend called, "Hey, Clyde, you nervous?"

"No," Burk answered quietly, "I'm not. But you see them fellers sittin' down there along the fence? The ones that's got calves tied in 13 and 14? They're the ones that are nervous!"

A few minutes later Burk backed into the box. Out he came, riding like a blue norther, and when he was finished he had tied a calf in 12.4 to win the roping.

Calf roping has been a favorite rodeo event for about 35 years. Last year some 500 rodeos, approved by the Rodeo Cowboys' Association, were staged in more than half the states in this country and Canada. Each rodeo had calf roping.

The rules are much the same now as when cowboys first gathered to rope against time. The calf is put in a chute. In another similar chute or box wait the roper and his horse. When the calf is released and crosses a designated line, the horse and rider start after the calf and the timers start their stop watches. When the calf is caught and tied by any three legs, a judge in the arena flags the tie, signaling the timers to stop the watches. He then inspects the tie to make sure it conforms to the rules.

Tying really "fast" calves is an art attained only after years of constant practice. A split second here or there can mean the difference between a fat check or no

check. So most ropers try to perfect their groundwork — handling stock and wrapping it up. More is needed here than skill; a man has to be strong and smart.

Head and shoulders above everyone else in the roping world at throwing and tying bone-busting calves is "Toots" Mansfield of Big Spring, Tex. Mansfield, a loose-jointed, limber-bodied cowboy of 39, has been roping professionally for 18 years and has unquestionably pocketed more money than any other roper. In 1948, at the height of his career, he paid an income tax on \$29,647—all earned with his loop-slinging right arm.

Weighing 185 pounds and standing a stingy six feet, two inches, Mansfield goes after calves as if he were getting ready to barbecue them for supper. He can slam

Most ropers leave the chute with two nooses and several tying ropes





Here's the great Baldy in action under Jack Skipworth. This horse stopped so fast he sometimes threw rider

them to the ground from either side and tie them with amazing speed. He's a fierce competitor and is very seldom rattled by an audience.

About the only major changes in modern roping have been in the stock—the horses and calves. Today's horses are real speed merchants, trained with painstaking care especially for the job of catching and holding a calf. The calves are smaller, in general, and are mostly Brahman weighing 250 to 300 pounds.

Rope horses play such a vital role in calf

roping that it is not unusual for some of the best ones to change hands for \$5000 or more. And when a cowboy gets a top horse that suits him, he is reluctant to sell him at any price. A level-headed, even-tempered mount with the heart to go all out is wanted.

Because of their build—short, compact and heavily muscled—most rope horses are of the quarter-horse breed. In action, a roping quarter horse is backed into the box, where he stands quietly without rearing or pawing until the calf is turned out. Then the horse breaks from the box, getting into high gear from a flat-footed jump in a few short strides. He must overtake the calf as quickly as possible and then rate his own speed to that of the calf. When the roper catches and bails out of the saddle, the horse is expected to stop fast and back up a few steps. As the roper throws and ties the calf, the horse must keep the rope taut enough to help the roper in his groundwork but not tight enough to choke the calf.

Probably the greatest money-grabbing rope mount of all time was Baldy, now retired on Troy Fort's Lovington, N. Mex., ranch. The bald-faced sorrel's career is particularly interesting because he nearly burned to death when he was four.

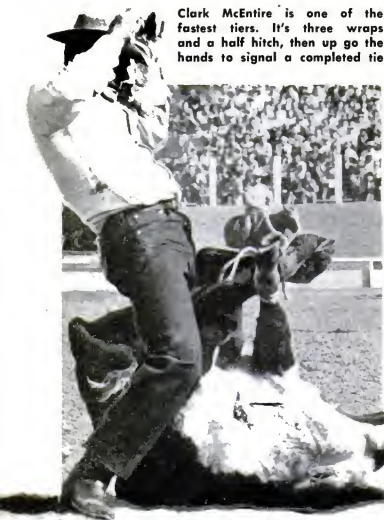
Ike Rude and Junior Caldwell, two rodeo riders, were traveling with Rude's horse, Baldy, in a trailer behind the car. Suddenly the car began to sway from side to side.

"We got a flat?" asked Caldwell.

Rude looked in the rear-view mirror and slammed on the brakes, yelling "We're afire!"

A cigarette, tossed carelessly from the moving car, had ignited the loose straw on the trailer floor and the

(Continued to page 252)



Clark McEntire is one of the fastest tiers. It's three wraps and a half hitch, then up go the hands to signal a completed tie

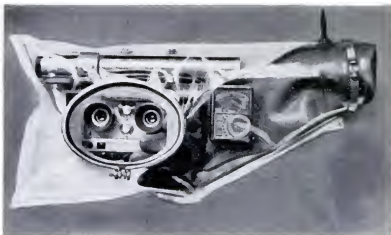
Bag Protects Camera For Underwater Shots

No box or rigid case is required to protect the camera in a new system of underwater photography developed in France. The camera is installed in a plastic bag with the lens behind a glass window. A rubber glove is clamped in a collar at one end of the bag. Air is then blown through a valve to inflate the bag. The photographer slips his hand into the glove to operate the camera.



Weed Killer Aids Soil

Double-acting calcium cyanamide, a chemical which kills weed seeds and fertilizes the soil, is now available to home lawn-and-garden owners. For about three weeks after it is applied, the dry, granular material kills weed seeds. Then it undergoes a rapid chemical change to supply lime and nitrogen to the soil.



"Crow's Nest" on Cycle Serves as Hunting Perch

German hunters sit up to shoot-up on a telescoping "crow's nest" mounted on their motorcycles. Tripod legs provide stability

12-Ton Window Stops Atomic Rays

Heavy glass windows, some of which are six inches thick, six by eight feet in size and weigh as much as 12 tons, will protect the workers from atomic radiation during the research and development of an atomic-powered airplane. Employees using manipulators will be able to perform their experiments in safety while looking through the heavy windows. The windows are made up of a number of pieces of glass stacked together in a steel frame. Three different densities of glass are used, including glass with a density of 6.2, one of the densest glasses ever melted. It is six times as heavy as water, or almost as dense as steel. The other two types of glass have densities of 3.2 and 2.7. Corning Glass Works made the windows for the National Reactor Testing Station in Idaho.

Take Your Choice: Open-Road Speedsters—



Plastic Sportster

Molded in a single piece of glass-fiber plastic, a new sports-car body is designed to mount on a standard Ford chassis from the years 1949 through 1951. Actually, there is room in the engine compartment for any of the stock V8 engines available today. There is also enough room under the hood to move the Ford engine back more than a foot, if desired. The plastic body is produced by a company in Houston, Tex.

Propeller Drives Car

Eliminating transmission, differential and other heavy components, a propeller-driven automobile built in Argentina will go 165 miles per hour when powered with a conventional Chevrolet engine. It accelerates from zero to 60 miles per hour in less than 10 seconds. The engine is mounted in the rear, driving the propeller with motor-cycle chains.



Plastic Car From Argentina

Powered by an air-cooled four-cylinder engine, a plastic sports car, the Justicialista, is being mass-produced in Argentina. The first automobile mass-produced in that country, the car can attain a top speed of 92 miles per hour and go 24 miles per gallon. The body is of reinforced plastic and has a removable top. Weight of the car is only 1600 pounds; horsepower is 55.

or Traffic-Dodging Gasoline Misers

Three-Wheel "Family Car"

It may be a little crowded, but it certainly is economical to take the family for a ride in a three-wheeled Austrian convertible. The single rear wheel is driven by a one-cylinder, two-stroke, nine-horsepower engine through a four-speed gearbox. Top speed is 50 miles per hour and the tiny car will travel 100 miles on a gallon of gasoline. Empty, it weighs only 420 pounds.



Motorcycle Canopy

Rain, wind and snow don't bother motorcyclists enclosed in a new canvas-and-plastic cabin. It shelters two passengers and can also be used as a pup tent when camping. It was shown at the recent Motorcycle and Bicycle Exhibition in Nuremberg, Germany.

Inflatable Top

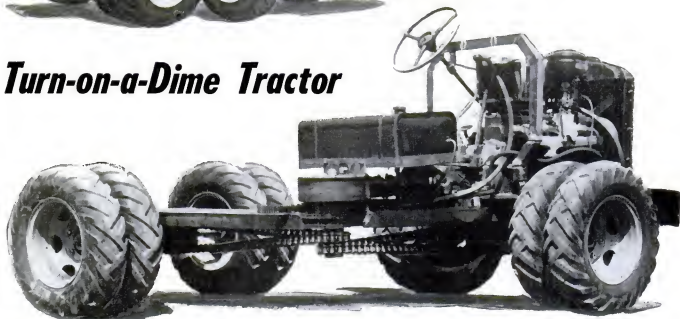
If it starts to rain while you're driving around in a German motor scooter, you pull a plastic top out of its carrying bag, blow it up and snap it in place. Longitudinal air cells stiffen the top so it is self-supporting, eliminating the need for a conventional framework. The three-wheeled scooter, incidentally, has a $4\frac{1}{2}$ -horsepower engine and runs along easily at about 40 miles per hour.



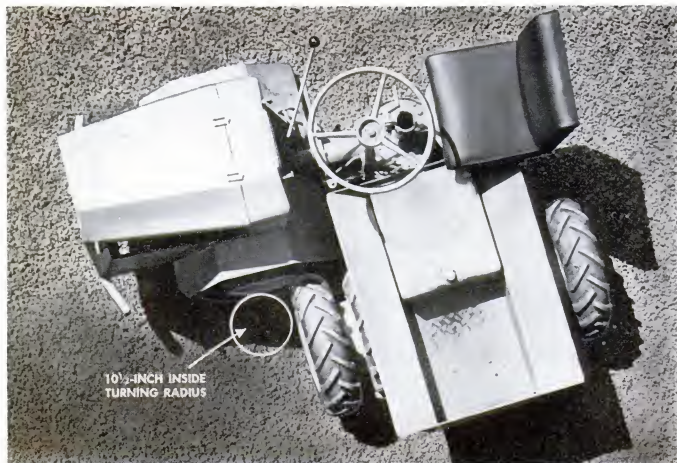


JOINTED in the middle, a new tractor has an inside-turning radius of only $10\frac{1}{2}$ inches. The tractor has a four-wheel drive but, due to the design, any number of additional power wheels can be installed. This makes it possible to design special tractors for swampy areas or steep slopes. The models now in production are rated at 25 and 100 horsepower. Most of the implements, including cultivators and sickle bars, are pushed instead of pulled, giving the operator a good view of his work.

Turn-on-a-Dime Tractor



Machine is made in two four-wheel-drive models, both jointed in the middle to shorten the turning radius



10 1/2-INCH INSIDE
TURNING RADIUS

Hobby With a Bang— **BIG GUNS IN MINIATURE**



Engineer Herd and son flinch at the instant of firing as a 1650 model field cannon goes off with a bang

By Jack B. Kemmerer and Douglas N. Rhodes

A QUIET MAN most of the time, Harold H. Herd uses his hobby to relax with a bang—literally and loudly.

Herd, a California engineer, builds and fires some of the world's smallest real cannon. His working scale models of historic military ordnance range from 14th Century French bombards and Italian cerbotana to Rodman siege guns, the heavy artillery of the Civil War.

The little big guns are complete to the tiniest detail in appearance and can be loaded, primed and fired exactly like the originals. Their accuracy at hitting long-range targets amazes champion rifle marksmen. On the office walls of his instrument-and-optical factory, Herd displays punctured targets that are a tribute to his ability as a gun craftsman—one-inch bull's-eyes perforated by .50-caliber shot fired from tiny cannon at 200 yards. Some of the guns, he declares, could kill a rabbit at 2000 yards—if he could ever hit such an

elusive, hopping target at that long range.

The bearded engineer's interest in historic cannon was sparked in 1949 when his son, Howard, then five years old, became fascinated by an ancient fieldpiece on display at the Los Angeles County Museum.

"He talked of nothing else for weeks,"

Building a scale model that works requires lots of painstaking research. Herd checks the barrel of a Civil War trench mortar





Son Howard drills a gun barrel with his Dad's help



Howard, who pestered his Dad into making his first cannon, rams home powder, wadding and cannon ball



Next, Herd drills holes in the barrel for inserting the trunnions, the pins on which the barrel pivots

Herd prepares to fire "Bambi," his favorite cannon, a half-size model of a 1400 Tower of London piece





With the trunnions inserted in the holes, the barrel is heated in an oven to assure a good bond of solder

Herd explained, "and pestered me to build him a toy cannon like the big one in the museum. Finally, I went back and measured the gun. Later I studied ordnance design in a borrowed library book.

"Soon I was as interested as Howard and began to work on a model—a quarter-inch-to-the-foot miniature. After a lot of trial and error I completed the gun and was proud of the job. I showed it to my son. He looked at it and said: 'Okay, Daddy, now let's shoot it.'

"It didn't take long to discover that my cannon might make a good ornament, but it was no working model. The thing was just too small to fire black powder and ball. I decided to start over and do it right."

Herd made another model of the same gun, this time on a half-inch-to-the-foot scale. He found that it worked perfectly and fired a little molded cannon ball with fine accuracy and excellent sound effects.

In the past five years, Herd has built several hundred cannon. His personal collection now numbers about 20 pieces in varying scales from one half inch to one inch to the foot. There are a few cannon that are even larger. All are actual working models.

Herd's favorite is a strange weapon he's nicknamed "Bambi"—a one-half-size copy of a small-caliber cannon built in 1400 to guard the Tower of London. This odd gun was so small it could be carried around by one man. It is easily recognized by its earlike handgrips for controlled trajectory and sweep.

"There is no other cannon like it in the world," Herd explains. "It was nearly 500 years ahead of its time in efficient artillery design, but it resembles a spread-legged deer more than it does a cannon. That's why I call it 'Bambi.'"

Herd had a problem finding a suitable place to test-fire his guns. The local police frowned on cannon shooting within the city limits. He finally found a remote canyon in the San Gabriel Mountains to the north of town. He was blasting away happily one day when a deputy sheriff appeared.

"What's all the shooting about?" he demanded of the engineer.

"I'm test-firing my cannon, officer," Herd

All the kids in the neighborhood must be envious of Howard Herd and his cannon firing. The tiny but precise models fire a small cannon ball with the accuracy of a rifle—and with a bigger bang





Once the tiny gun is aimed at the target, all the cannoneer has to do is light the priming fuse with some Chinese punk or a lighted cigarette

replied. "I didn't think anybody would mind out here. Not a soul around for miles. Is it against the law?"

The deputy scratched his head, looked at the arsenal of tiny pieces lined up on the ground and said hesitatingly: "I just don't know—never had a case of cannon firing before. I guess it's all right. Say, I'd like to come back when I'm off duty and fire one of those things, if you don't mind."

Herd now uses a rifle range operated by the San Gabriel Valley Gun Club in Azusa, a few miles from his home. His cannon are the principal object of attention whenever

metal parts. Carriages and wheels are carved and turned on a lathe from hardwood. Brass, copper or iron fittings are attached after the model is assembled.

Ordinary black powder serves as the charge. Miniature cannon balls of required caliber are made by melting scrap lead on a kitchen stove and pouring it into simple molds.

To fire one of the guns, the cannoneer charges it with a carefully measured amount of black powder. Then he adds a small paper wad and after this he inserts the tiny cannon ball itself.

The whole load is then ramrodded into place and the gun is ready to be fired. The priming fuse is ignited with a lighted cigarette or a smoldering piece of Chinese punk and in a second or so the gun goes off with a bang. This procedure is the same as the one used by cannoneers in centuries past as they loaded and fired the full-size originals of Herd's models.

Cost of firing even the largest model is estimated by Herd at about one-half cent a shot.

"And that's, to use a current Army slogan," Herd says, "a lot of bang for a buck!" ★★★

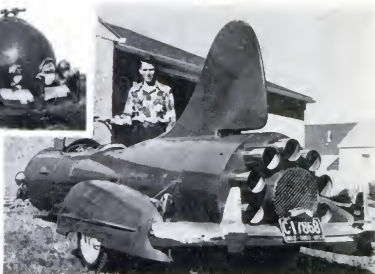
When the powder charge goes off, there's a loud report and the ball hits the bull's-eye with great accuracy even at a distance of 200 yards





Jet-Age Custom Car

No flames spout from the tail pipes of a custom-built three-wheeled car, but that is about the only difference between it and a space ship! The engine is a 60-horsepower V8 mounted in the rear. A single front wheel is suspended on a motorcycle fork. The sheet-metal body is welded to the frame. Air scoops on each side of the body ventilate the engine. The 10 tail pipes permit the hot



air from the engine to escape. The unusual car was built by Stanley M. Eakin of Grove City, Ohio. It took six years of his spare time. Top speed is about 90 miles per hour.

Robot Watchman Protects Pump Engines at Untended Oil Wells

Pump engines at untended oil wells are protected from damage by a new control that shuts off an engine when trouble develops. The device keeps tab of engine vacuum. When the engine speeds up or

slows down, the change of vacuum actuates a switch that stops the engine. An indicator needle registers slight changes that warn of future trouble. Bryan Thomas, at Oil Center, Okla., developed the control.

Inflated Plastic Suit Shields Worker in Atomic Laboratory

Radioactive dust doesn't bother a worker at the General Electric plutonium plant in Richland, Wash., who walks around in a plastic balloon. The suit provides a protective barrier against radiation in "hot" areas, permitting checking for contamination, clean-up and maintenance work. A flexible plastic tunnel at the rear of the suit connects to a port in the wall, provides air and serves as an entrance and exit passage. An air mask is worn ready for use in case the suit develops a leak. The suit and tunnel remain inflated because air inside the contaminated room is at a lower pressure than air on the outside. Any flow of air is into the contaminated area rather than out.



Information not listed on articles in the index frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge from Bureau of Information, *Popular Mechanics*, 200 East Ontario Street, Chicago 11

RUBBER BUTTERFLIES

By Walter E. Burton



A BUTTERFLY that glided past his porch launched George Riddell, of Cuyahoga Falls, Ohio, on a new hobby.

Riddell, 68, began making molded-rubber fish baits several years ago as a hobby-business. His baits consisted of lifelike replicas of frogs, crawfish and other things attractive to fish. From the start, he had little difficulty selling enough, at good prices, to make his bait business—which was primarily a hobby—self-supporting. But when some large companies entered the bait field on a quantity-production basis, Riddell found it difficult to compete. His hobby was becoming a burden.

One day, while he and his wife were sitting on their porch, a butterfly winged by. Suddenly Mrs. Riddell said, "How about butterflies? You could make them of rubber, just as you do your fish baits."

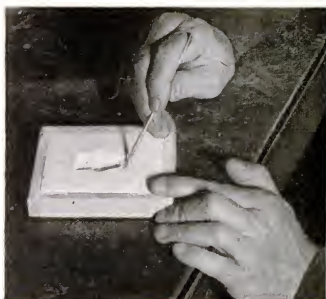
This was as good an idea as any to date, so Riddell hurried to his basement workroom, got out a block of plaster, and began sketching on it a pattern for a mold. But it was six months before he could mold a satisfactory butterfly. He found that the insects are not the easiest things to copy in rubber. For one thing, any genuine butterfly would be a poor pattern even if a plaster cast could be made of it easily. For technical reasons, in creating a rubber replica of an insect, certain departures from nature

usually are necessary. Nevertheless, the butterflies and other creatures Riddell now makes are surprisingly realistic.

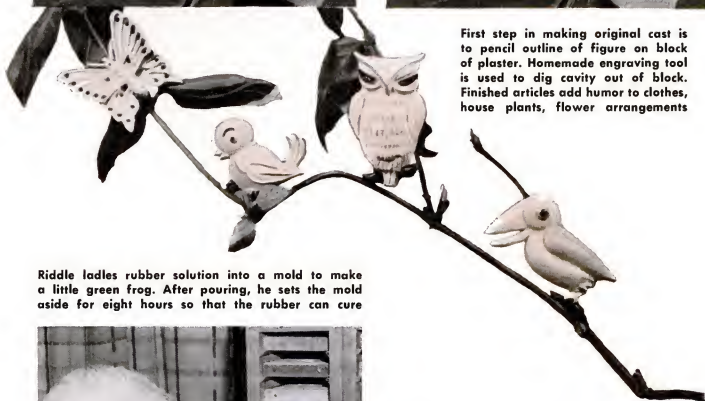
When he finally succeeded in molding a satisfactory butterfly, he gave it to his wife. She wore it like a brooch. Other women saw it and wanted copies, and Riddell found himself in the butterfly-making business.

The hobby launched by that first butterfly grew until Riddell's line now includes several sizes of butterflies, a wise-looking owl and two other birds, and a frog that looks real enough to jump. He sells these directly and by mail, but never through retail stores. Many of his items were brought out as a result of popular demand. One of these is a series of kits for people who want to make their own butterflies.

The molds he uses and those he sells to other hobbyists are made of plaster. A plaster mold, largely because of its porosity, imparts to the rubber a texture that is remarkably real looking. He uses compounds of various colors, and makes little attempt to follow nature's color schemes. Colored details such as dots on butterfly wings are made with colored rubber; no paints, lacquers or similar pigmented materials are used. Consequently the colors will stretch with the rest of the rubber, cannot flake or rub off, are washable and will last as long as the rubber itself. ★ ★ ★



First step in making original cast is to pencil outline of figure on block of plaster. Homemade engraving tool is used to dig cavity out of block. Finished articles add humor to clothes, house plants, flower arrangements



Riddle ladles rubber solution into a mold to make a little green frog. After pouring, he sets the mold aside for eight hours so that the rubber can cure



Block holds butterfly in proper position as parts are cemented together and dots of color are added





White House Is Home for Martins With Presidential Ambitions

Martins with presidential aspirations can live in a "White House"—or at least a martin-size copy of the presidential mansion. Dr. Charles C. McGuire of Minneapolis, Minn., built a 28-room martin house that has cross ventilation in every room.

The differences in the martin house over the real thing are for the martins' convenience. The second-story porches are not "genuine," but give the birds a place to stand outside the upstairs entrances. The inside lifts out for cleaning.

Small Electroplating Tool

Hobbyists can electroplate jewelry, hardware, silverware, chrome appliances and even the trim on automobiles with a small tool that contains two miniature batteries. On one end of the tool is a brush for applying the metal solution. At the other end is a short cable that fastens to the object to be plated. Each kit comes with brush and a bottled solution of gold, silver, copper, a chromelike finish or rhodium.



Windshield Has Viewing Slit

Rain or snow doesn't block vision through a plastic motorcycle windshield that has a slit for the driver to look through. The top portion of the shield, the part above the slot, is mounted at an angle to deflect insects, raindrops and other airborne materials over the driver's head. The screen is a big help at night because it eliminates the glare that usually results from scratched plastic windshields. The windshield is made in Germany.





Perrine notches sheared strips in last step of punching process. Finished strips at left are ready for bending

Homemade Shaping Tools Put Inventor in Business

PAUL PERRINE, of Lawrenceburg, Ind., thought his new invention would appeal to thousands of housewives. The only trouble was that the manufacturing dies needed to make the simple device—a metal spoon holder—would cost \$1000. Perrine didn't have that kind of money. So he enrolled in a machine-shop course at the local high school and learned enough about mechanics to build his own manufacturing tools. Cost: \$25. Now he can turn out 100 to 150 holders per hour with his table-top setup.

His equipment consists of a punch press and a bender tool, both operated by hand. Three different punches, with corresponding die plates beneath, are used in the shearing process. A shear punch cuts aluminum strips to the proper length. The next punch puts a bend in one end of the strip. A third puts a small notch in the end opposite the bend. Perrine puts the necessary curves in a sheared piece by revolving the arm of the bender tool and another holder is completed.

The 24-year-old inventor is sure that other persons, using similar homemade tools, could transform their pet schemes into salable products with little expense.



Last step is to curve strips with bending tool. The holder secures spoon on edge of pot, keeps it cool





Voss awoke to see a steamer's lights bearing down on his drifting boat. Frantically, he waved a burning rag

An almost forgotten Odyssey—

40,000 MILES in an INDIAN DUGOUT

Already 50 years old, the dugout canoe looked like this when Voss found it on the Beach at Victoria harbor



Although Voss didn't sail around the world, he did travel 40,000 miles in his 38-foot dugout canoe

By Francis Dickie

FIFTY YEARS AGO this month, a tiny sailboat, its hull a hollowed-out cedar log, dropped anchor in an English harbor, marking the end of an amazing 40,000-mile voyage.

The skipper was Capt. J. C. Voss, a 43-year-old Canadian. For more than three years, he sailed the oceans in his 38-foot craft as it meandered from Victoria, Canada, to London, England.

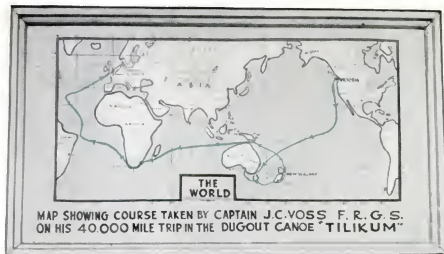
The hull was a cedar dugout canoe bought from an Indian for \$75 and strengthened with an oak frame. A 300-pound keel and 1000 pounds of ballast were added.

Inside the hull, Voss built a 5-by-8-foot cabin, his home for three years. There were three small masts supporting four sails. One man could set and take in all the canvas from the cockpit. The boat had no engine to depend on in emergency.

Voss named his strange craft *Tilikum*—a Chinook word meaning friend.

Voss and his partner, a writer named Norman Luxton, left Victoria on May 27, 1901, for Suva. After a series of violent storms, the boat finally made Suva and Luxton decided he'd had enough. Voss took on Louis Begent as seaman, the second of nine companions on the long trip.

At night, six days later, running ahead of a furious sea, Begent carelessly let go of the tiller momentarily, letting the boat swing far around into the wind. A huge wave poured over the craft hurling Begent into the sea. Voss was unable to save him.



The Canadian sailed on toward Sydney alone and without a compass, it having gone over the side when the luckless seaman was washed overboard.

As the sea calmed slightly, Voss put out his huge sea anchor and lay down to rest, letting the boat drift. He awoke in the darkness to see the lights of a steamer bearing down on him. He lighted a kerosene-soaked rag and waved it frantically. The steamer altered course just in time, passing by the battered *Tilikum*.

At Sydney, Voss renewed his finances by putting the strange craft on display. The crowds were so large that he stayed two months and decided to combine showmanship with sailing. He showed his boat in Tasmania, New Zealand, South Africa, South America and some of the European islands. He hauled the boat inland to show it to persons who had never even seen the sea.

On September 2, 1904, the *Tilikum* arrived in England, three years, three months and 12 days after it left Canada. The boat was brought back to Victoria and placed on permanent display in 1930. ★ ★ ★

Abandoned by Voss in London, the *Tilikum* was returned to Victoria years later and put on permanent display



Live Steam on Four Rails

By Harry De Lasaux



It's a long uphill pull with a full load of 10 passengers, but the steam switcher makes it without strain

EVERYBODY GETS a free ride Sundays on the Golden Gate Live Steamers Railroad. Owned and operated by hobbyists who shun such contradictions as the electric-powered "steam" locomotives common on most model railroads, the layout includes 1300 feet of track in Redwood Regional Park east of Oakland, Calif.

The tracks are on a trestle 30 inches

aboveground. Passengers ride sidesaddle on padded flatcars behind engines that puff realistically.

Four tracks provide three gauges simultaneously. The gauges are 2.75 inches, 3.75 inches and 4.50 inches. All flatcars run on the broadest gauge, using the two outer rails, to insure stability under heavy loads.

The first part of the run is the easiest,

In the layout are 1300 feet of track. Train riding appeals to adults as well as to youngsters as you can see





Note that this Pacific-type, alcohol-burning 4-6-2 locomotive runs on a narrower gauge than the flatcars do

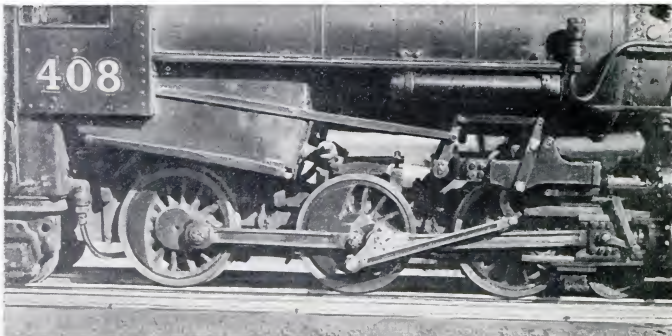
being slightly downhill for about 300 feet. After a curve and a broad circle, the right of way takes a sharp uphill grade. The writer watched with amazement as an 0-6-0 switcher hauled 10 persons up this grade without stalling.

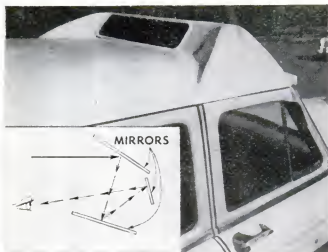
Club members consider live-steam railroading the highest form of scale-model activity. They build their own locomotives, machining nuts and bolts, wheels, pistons

and other parts. Blueprints of full-scale locomotives are followed.

With steam chuffing from stacks and cylinders, the engines provide the ultimate in realism. And there's no disputing their pulling power as they haul passengers around curves and upgrades. Nor is there any disputing a quite different sort of pull they have on both young and old every Sunday afternoon. ★ ★ ★

Realism in design and operation is a must on live-steam models. Drive system functions like the real thing





Mounted in a built-up roof, the rear-vision system has three mirrors and provides 140-degree rear view



Photo of driver's view in periscope. Car overtaking him is in view until it comes even with rear bumper

Periscope Built Into Car Roof Provides 140-Degree Rear Vision

Anxious to solve the problem of the rear-view mirror that is plaguing the auto industry, Daniel Stocker of Hammond, Ind., designed and built a periscope into the roof of his station wagon. There are three mirrors in the periscope and the driver can see the full width of the road directly behind his car. Passengers or bundles inside

the car don't interfere with the view. The periscope is molded into the roof of the station wagon and the front portion of it extends over the windshield as a visor. An adjustment of the mirror system sets the view to fit the individual driver. Stocker has patented the invention and has also designed a similar periscope for airplanes.

Predict Short Design Life for Supersonic Planes of the Future

Supersonic jet planes of the future may be designed to last only a limited time, according to Dr. George Gerard of New York University. Friction with the air would heat the metal of the plane to several hundred degrees, thus weakening it and reducing its life span. Aircraft strong enough

to withstand such temperatures would have to be much heavier and less maneuverable. At five times the speed of sound a supersonic aircraft would encounter temperatures as high as 1600 degrees Fahrenheit. Present engineering practices call for building planes for long durability.

Generator on Side of Tractor Produces Electricity Anywhere on Farm

Farm tractors, which now provide the farmer with mechanical and hydraulic power, may soon furnish him with portable

electric power. Under development by International Harvester is an electric generator that can be installed on the right side of larger tractor models. Power from the tractor engine is transmitted through gears and a pulley to a V-belt which turns the generator. The resulting electric power can be used either to run motors on attached implements or to operate portable tools or lights anywhere on the farm. The generating system also can be installed in the body of some truck models. Development of the system is still a research project and the generator unit is not yet available to farmers.

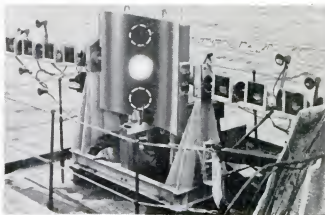




Lights Reflected in Mirror Aid Landings on Carrier

Big curved mirrors and lights will soon replace signalmen as aids to landing jets on British aircraft carriers. The new landing system incorporates a large curved mirror which the pilot watches as he approaches the carrier from astern. It has a gyro-operated mounting which keeps it at the proper level even in rough seas. Two lines of colored lights flank the mirror and, from the aft part of the ship, light is beamed into the mirror. The pilot knows that his angle of approach is correct as long as he keeps the reflected light from the mirror in line with the colored lights flanking the mirror.

Since the pilot must keep his eyes straight ahead on the lights, he can't look



British Information Services photos

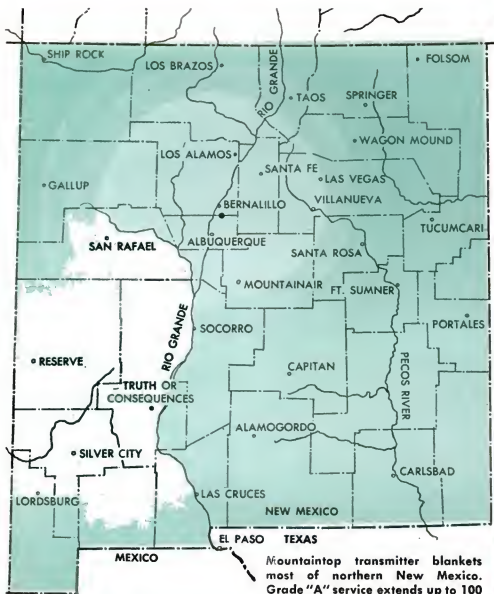
down at the instruments to check his approach speed. Instead, colored lights attached to his air-speed indicator reflect in his windshield to tell him if he is flying too fast, too slow or just right. Night and day tests have been made.

Amphibious Boat

American oil hunters in the swamps and mud flats of Venezuela are using a boat that travels on land or water. At its stern are two paddle wheels that push the boat along in the water or pull it on land. A 3½-horsepower motor powers the unit, which will carry several hundred pounds of supplies and equipment.

☛ Nuclear bombardment of seed oats at Brookhaven National Laboratory has resulted in a mutated strain resistant to rust disease.





TV FROM A MOUNTAINTOP

By George Gregg

TALK WITH the engineers of almost any television station and they'll readily admit that their greatest problem is sending their pictures far enough to reach their audience.

Down in the middle of New Mexico a couple of stations have almost the opposite problem—they are apt to send their signals winging far over the heads of their choicest target, somewhat like a hunter shooting downhill with the bullet soaring 10 feet above the deer.

KOB-TV and KGGM-TV have boldly planted their transmitters high atop a two-mile mountain near Albuquerque. The installation is easily the highest in the nation; staff members can claim kinship with the relative handful of humans who work, eat, sleep and live above 10,000 feet elevation. The lofty site gives assured coverage of a

large part of New Mexico and "freak" reception has been reported from South Carolina, Minnesota and Oregon.

The location is so high above Albuquerque, the principal target, that the signals must actually be bent *downward* to reach the city. Even so, houses along the very base of the mountain get almost no reception though they are less than two direct miles from the transmitters.

The site might have been made to order. The east side of the Sandia mountain range, the side facing Texas and away from Albuquerque, slopes in normal mountain fashion. But the side which towers above the city is sliced off like an anthill cut through the center. From the 10,679-foot crest to the 5000-foot flat mesa and Rio Grande Valley the drop is almost sheer, nothing but precipitous cliffs, jutting crags



Highest transmitter in the nation is shared by two stations. Ridge in background is 2000 feet lower

and narrow ledges that even the native goats and pines can barely cling to.

When eastern TV engineers saw the possibilities of the site they chortled with glee. Their enthusiasm increased upon learning that a road existed to the highest pinnacle, where a fire lookout was maintained during the summer. But a trip up the road made the prospect less appealing. Although the peak is only about 10 miles from Albuquerque for an eagle, it is 35 miles for a good car—22 miles of hard-surfaced highway and 13 miles of fantastically twisting, looping, hairpinning dirt-and-rock road. From November to April the last 10 miles of rock is usually covered with snow and ice.

No one had ever spent a winter on top and the few parties that had climbed the mountain during the cold season brought back tales of deep snow, extreme cold and raging windstorms. Even the U. S. Weather Bureau couldn't tell them exactly what to expect at 11,000 feet. Winter snows at similar locations in the state were estimated at about 300 inches, and at slightly lower

locations temperatures as low as 50 degrees below zero had been recorded.

The natural difficulties were too much for one station and one purse, but when the big TV freeze ended in 1952 KGGM-TV and KOB-TV decided they could swing it together. The combination proved highly successful.

Construction began in the spring of 1953 and the first pattern was telecast September 30, a near record in view of the special problems posed by the location. Trucks hauling heavy equipment from eastern manufacturers had to be unloaded at the foot of the mountain and repacked with only about half their normal load. Even so, they wheezed and puffed up the steep grades. Holes for pilings and for power-line poles had to be blasted from solid rock with dynamite. Hauling ready-mix concrete to the site was out of the question, so all sand, gravel and water was carted up the mountain and mixed on the spot. Dump trucks carrying the aggregate could be only half loaded, else they didn't get there.



Workmen install antenna of KGGM-TV on edge of mountain. Mesa 5000 feet below is at the Albuquerque level

The building unit evolved as three separate structures nestled into the mountain-side. The power room, containing three generators and fuel and water-storage tanks, was housed in one building, transmitters and living quarters in the central and largest structure and the third was designed for vehicle storage. Sound insulation was the reason for the separation, with fire protection as an added bonus.

A squat story-and-a-half tower was attached to the Albuquerque side of the main unit, vented with large square ports covered by plywood shutters. In this tower are located the parabolic "dishes" which receive the microwave signals from the studios and feed them to the transmitters. Almost no weakening of the signals is suffered by reception through the unpainted plywood panels, though engineers say definite loss is sustained when the signals must be transmitted through masonry or glass. Even the tiny metallic fragments in the pigment of ordinary paint are enough to disturb the sensitive signals.

The antenna towers and transmitting bays were designed to withstand tremendous ice and wind loads. Since wind speeds in the free air at this level often reach 50

to 75 miles per hour, it was thought advisable to use 135 miles per hour as a design figure, since the speed can almost be doubled by Venturi effects as the air is forced over the mountain. Figures for icing rates at such a location were practically nonexistent, but the engineers eventually settled for a maximum figure of three inches (diameter) of ice in combination with the 135-mile wind.

So far, the highest sustained winds have been less than 100 miles per hour, but on one memorable night a full six inches of ice coated the towers between sign off and sunrise. Fortunately, the ice that night formed with relatively light winds, so no damage was caused. But it took two full days to melt the accretion off, even with maximum use of the integral defrosters.

The high-level location had been eyed by weather experts long before the television age. Such high points are valuable in basic and applied weather research. From an 11,000-foot observation point, measurements can be made with little time, expense and chance for error. Weather Bureau officials were quick to see the possibilities of getting a costly weather station

(Continued to page 230)



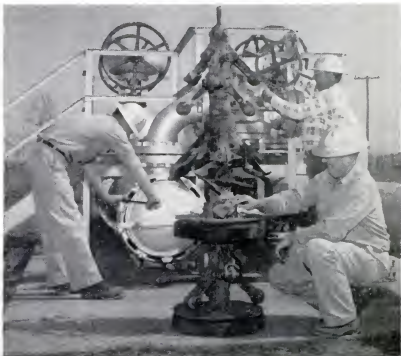
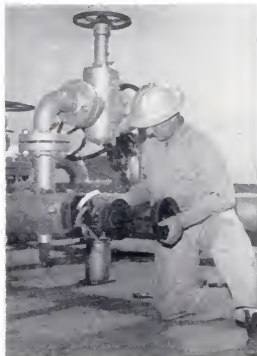
Pipe-line workers use "pigs" of various sizes and shapes. Some have cutting blades, others wire brushes

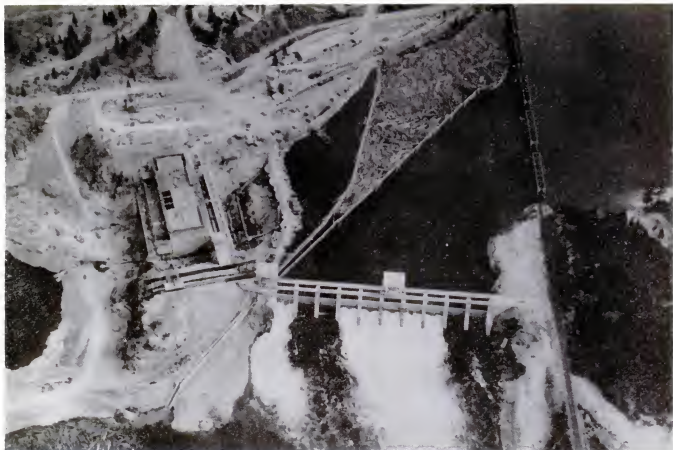
"Pigs" Root Through Pipe Under Pressure to Remove Corrosion

ROOTING THROUGH oil lines to scrape wax and corrosion off pipe walls are "pigs" that are made in a variety of shapes and sizes. The pigs squeal and grunt their way through pipe lines under water or oil pressures up to 1000 pounds. They push ahead

of them rust, rock, wrenches and anything else that happens to get into the pipe. The pigs vary in size from those for two-inch pipe up to the giants—taller than a man—which scrape out 30-inch pipe. They have a variety of cutting blades and brushes.

Pig is inserted in pipe and will be driven through under pressure. Some are more than six feet long



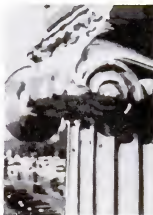


Logs "Shoot the Chute" To Bypass High Dam

Millions of feet of logs floated down the Pend Oreille River in Idaho are shunted around a high dam at Albeni Falls through a tunnel and chute. Ordinarily, such a dam would prevent passage. Rafted logs destined for mills at Newport, Wash., are towed across Lake Pend Oreille and down a 28-mile stretch of the Pend Oreille River to the dam's forebay. The logs are herded two or three abreast into a concrete trough 450 feet long, 6 feet wide and 10 feet deep. Gates at the upper and lower ends of the trough govern the elevation and velocity of water passing through the chute and tunnel. The logs, after a wild ride, come to rest in a quiet eddy below the dam.

Stone-Restoration Method "Face Lifts" Old Buildings

Stone buildings that have started to decay are made to appear like new by a restoration method imported from Europe. The stone of which the structure was originally built is broken up or crushed and mixed with a special paste, in the ratio of 85 percent stone to 15 percent paste. The mixture is applied in layers to the broken surface; deep cavities are filled with lumps of stone bedded in paste. The new surface can be worked and carved like quarried stone, looks like the original stone, and weathers the same way.



RADIO *Television* ELECTRONICS

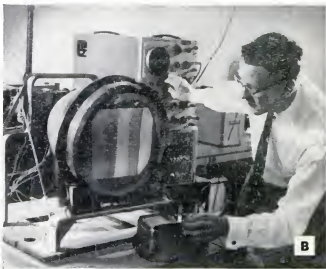
TELEVISION TODAY

TV "SERVICE-SAVER" is the title of the booklet held by the young lady using the telephone in photo A. Recently issued by the Raytheon Manufacturing Company, this booklet contains numbered pictures of faulty TV reception. It is a timesaver for TV-set owners and repairmen. The housewife matches the picture on the screen with a similar one in the book. She then reads the number over the phone to give the repairman a good idea of what is wrong before he leaves the shop.

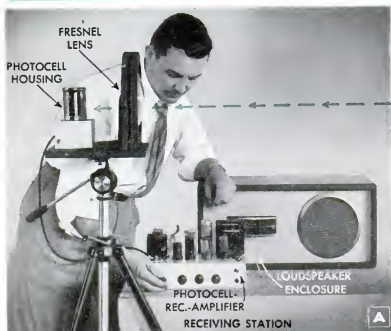
Intense activity in color TV continues in various manufacturer's laboratories. Photo B shows engineer Donald Perry in the service department of Motorola Inc., checking out the composite color-bar signal which appears on the oscilloscope and on the face of the color tube.

The TV set illustrated in photo C is a portable model available with either 17 or 21-in. screen. This decorator's model has control knobs on top, and a choice of "sleeves" in a variety of modern colors and durable fabrics that can be changed quickly.

The first compatible color-TV cameras to come off the television industry's commercial production lines are the two units illustrated in photo D. These RCA units were recently shipped to the National Broadcasting Company and the Columbia Broadcasting System respectively.



How to Transmit Phono

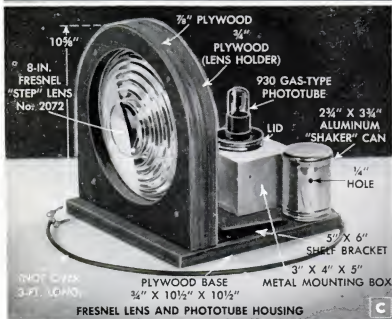
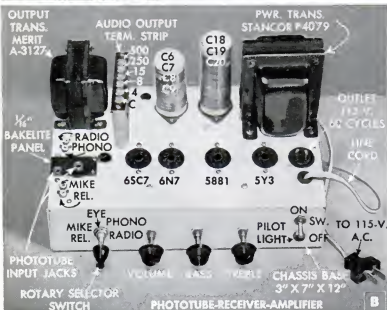


By Dr. Richard C. Hitchcock
and Frank L. Brittin, W9DCX

THIS EXPERIMENTAL two-unit system is a lot of fun to operate. The idea is not new to electronic laboratory technicians, but no peace-time applications for it have been suggested. Perhaps you can figure out some practical use.

One unit consists of a simple transmitter with provision for phono or microphone input. Most radio "hams" have many of the necessary parts in their junk boxes. The audio input at the transmitting end is amplified and sent as a carefully directed pencil-like beam of modulated light across space. At the receiving end it is converted into electricity, by means of a phototube, and the amplified output is then fed to a loudspeaker. In other words, it is a light-beam transmitter and an electric-eye audio-amplifier-receiver, with high-quality output.

The complete assembly for the receiving and transmitting stations is illustrated in photos A and B. In the transmitter, the plate of the output 6V6-GT tube is in series with a Sylvania model R-1131-C crater-type neon-glow lamp. Lamps of this type are available from radio-parts houses, and are used in facsimile transmitting systems. Due to the cost of this lamp, a d.c. milliammeter is always set at 20 ma. to protect it from overload. The beam can be projected from 5 to 30 or 40 feet to the receiving phototube with the lenses used. This beam can be intercepted at any point along the path; you can literally "stop the music" by placing your hand or anything opaque in the beam. The input at the transmitting end can be either a crystal phonograph pickup, output 1 volt, or a high-impedance microphone. If the crystal phonograph pickup has low output, less than $\frac{1}{4}$ volt, connect it to the "mike" jack.



Music on a Light Beam

Photos E, F and H show various views of the beam transmitter and its associated crater-lamp housing.

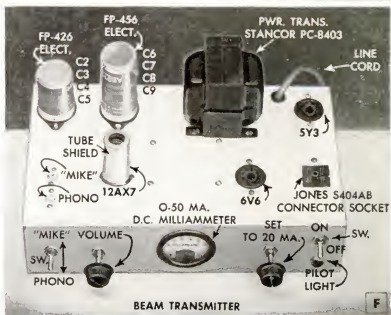
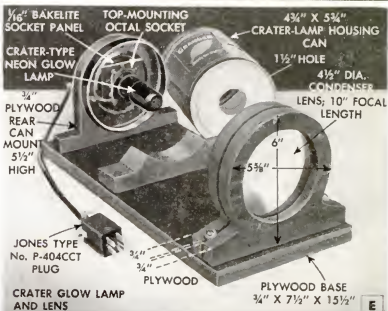
The schematic circuit diagram appears in Fig. 1 on page 164, together with a sketch of the crater-lamp housing, Fig. 1-A.

An electric eye (phototube) is only one of five inputs possible with the receiver-amplifier unit, Fig. 2. You can use this amplifier for other useful purposes such as radio, reluctance (magnetic) pick-up, crystal microphone, or crystal phono pickup. This unit and the phototube housing, with the mounted Fresnel lens, are illustrated in photos B, C, G and the detailed sketch (Fig. 3). Cable connections to the phototube are shown with the tube base symbol (bottom view) in Fig. 2-A. These connections are, of course, reversed in the top view of the socket. The interior of the "shaker" can is painted flat black.

If you are an electronic experimenter, the only unfamiliar items in the entire system will be the lens systems needed to focus the transmitted light into a concentrated beam, and then to bring this beam into the 1/4-in. hole in the aluminum shaker can that houses the phototube. at the receiving station. Both the phototube-receiver housing and the transmitter-lamp housing must be securely fastened to prevent motion once the beam is properly focused. Sturdy Quick-Set elevator tripods were used for this purpose, as shown in photos A and D. To line up the transmitting and receiving stations at a distance with the least trouble, do it at night, with practically no other lights around. Once lined up, all other lights can be turned on, and, of course, it works fine in daylight.

(Text continued to page 274)

(Circuit diagrams shown on page 164)



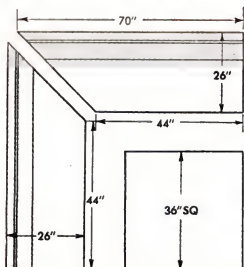
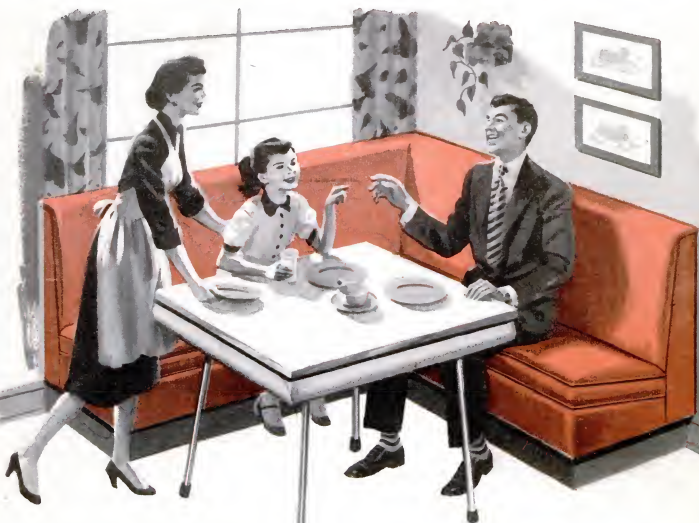
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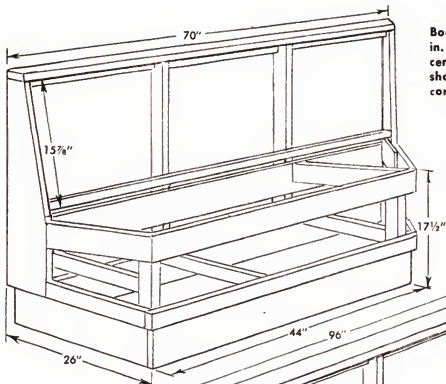
Custom-Build Your Own DINING BOOTH

By John Bergen

COLORFUL UPHOLSTERED booths lend atmosphere and utility to the dining area or recreation room, but the cost of custom-built booths places them beyond reach of most people. Now, however, you can stay within your budget and still have all the advantages of a good-looking dining booth by building one of the three styles detailed in this story. They are all roomy,

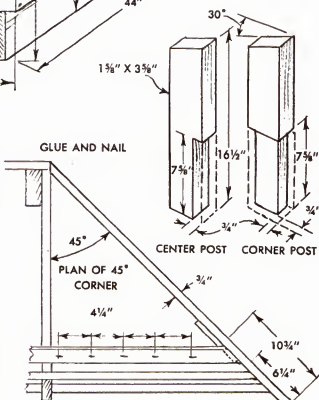
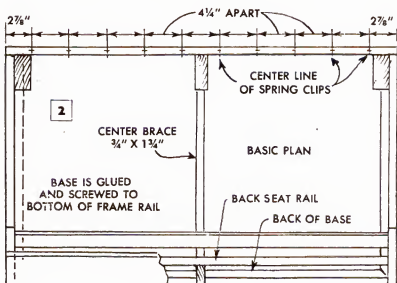
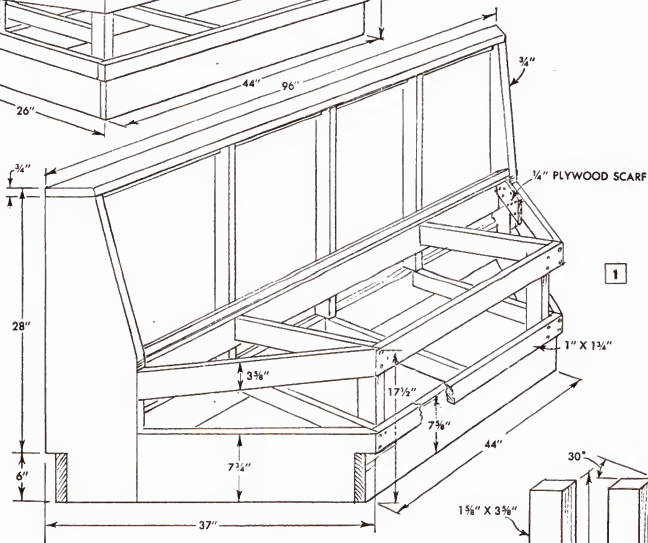
comfortable and covered with easy-to-clean plastic fabric. Suggested over-all dimensions are given in the arrangement plan accompanying each illustration and construction of the tables is detailed in Fig. 8.

Framing of the booth seats is detailed in Fig. 1. The center section of each seat is basic, the 45-deg. corner sections being added as needed. The plan for the center



Booth seats are built from a basic plan 26 in. wide by 44 in. long. This provides the center section to which are added triangular-shaped corner sections as needed. Two 45-deg. corners are set together to form right angle

Longest of the booth units, which is detailed below, consists of a center section with a 45-deg. section at each end. This normally would be used to form the rear seat of U-shaped booth



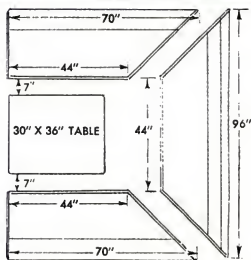
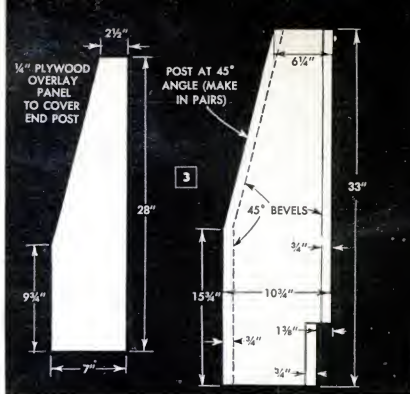
and corner sections is given in Fig. 2. Assembly details of the frames are shown in the perspective views in Fig. 1, while location and dimensions of the various parts are given more completely in the sectional view, Fig. 5. The center and corner posts are cut as in the detail to the right of Fig. 2.

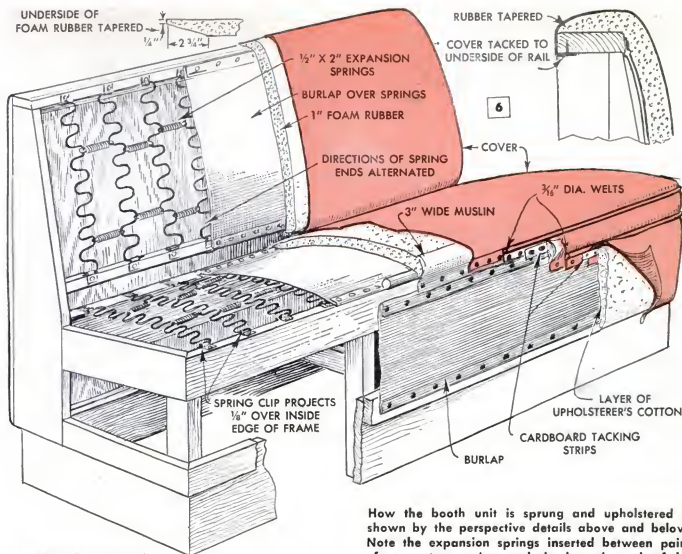
Dimensions for the back post, used when the end of the seat is square, are given in Fig. 5, and the back post for the 45-deg. corner is detailed in Fig. 3. The plywood overlay dimensioned in Fig. 3 is used in applying fabric to the exposed back posts. An overlay is needed for the square ends only, as the 45-deg. ends will be butted against each other. The seat portion of the 45-deg. end section is covered with a piece of $\frac{1}{4}$ -in. plywood which is cut as in the upper detail in Fig. 5. When this is covered with two triangular-shaped pieces of foam rubber, as in Fig. 4, a satisfactory cushion is provided without the need for springing.

The seat and back frames of the center section are fitted with no-sag type springs spaced at $4\frac{1}{4}$ -in. intervals as in Figs. 2 and 6. Use 11-ga. spring for the back and heavier 9 ga. for the seat, adding the necessary number of springs to the back for the 45-deg. corners.

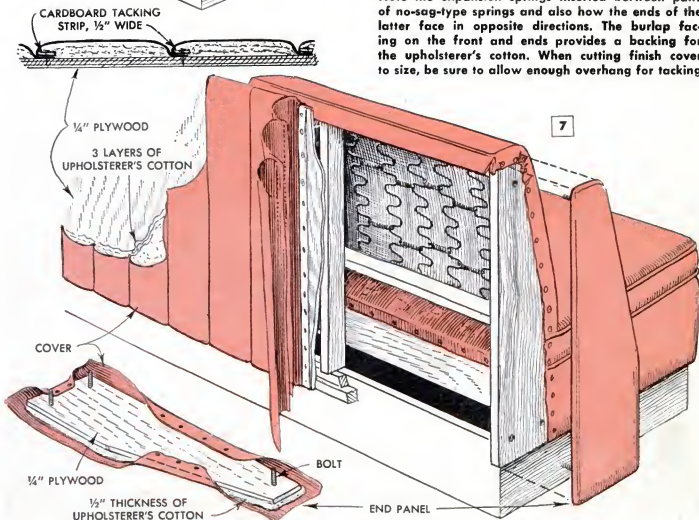
Note the length of the springs given in Fig. 5. It is important to cut all the springs for either the seat or back to the same length so the resiliency will be the same throughout the length of the unit. Measure the springs by uncoiling them flat along a yardstick. Then

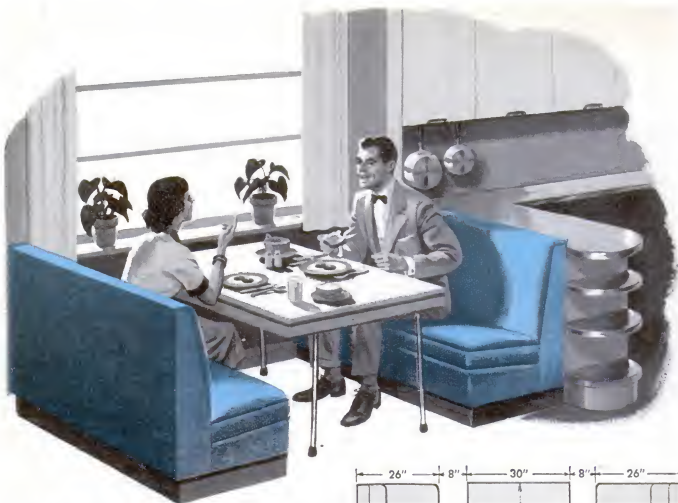
The U-shaped booth pictured below is ideal for the basement recreation room or for the larger breakfast nook. It consists of right and left-hand side units and rear unit as at the right





How the booth unit is sprung and upholstered is shown by the perspective details above and below. Note the expansion springs inserted between pairs of no-sag-type springs and also how the ends of the latter face in opposite directions. The burlap facing on the front and ends provides a backing for the upholsterer's cotton. When cutting finish cover to size, be sure to allow enough overhang for tacking





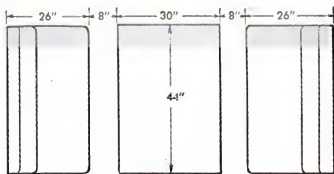
The breakfast-nook booth above consists simply of two 44-in. center sections and a 30 x 44-in. table. This provides comfortable seating for four persons

seat springs. After the no-sag-type springs are installed, hook $\frac{1}{2}$ x 2-in. expansion springs between them as in Fig. 6. These springs should be installed so that the ends of the hook point inward, away from the burlap and foam-rubber padding.

The burlap is tacked over the springs and to the front and ends of the unit as in Fig. 6. Then a $\frac{3}{4}$ -in.-dia. edge roll is nailed all the way around the seat rails, Figs. 5 and 6. You can make an edge roll by wrapping burlap around a firm hair or moss filler or you can buy one ready-made.

The next step is the application of the foam-rubber padding to the seat and back. Each pad should be cut 1 in. longer and $\frac{1}{2}$ in. wider than the section it is to cover. You might find it necessary to use two or more pieces of foam rubber for each of the pads. In this case, simply butt the pieces of foam rubber together and apply rubber cement to the butting edge of each piece. Allow the cement to become tacky (3 to 5 min.) and press the pieces together. Do not attempt to assemble the cemented pieces for several hours.

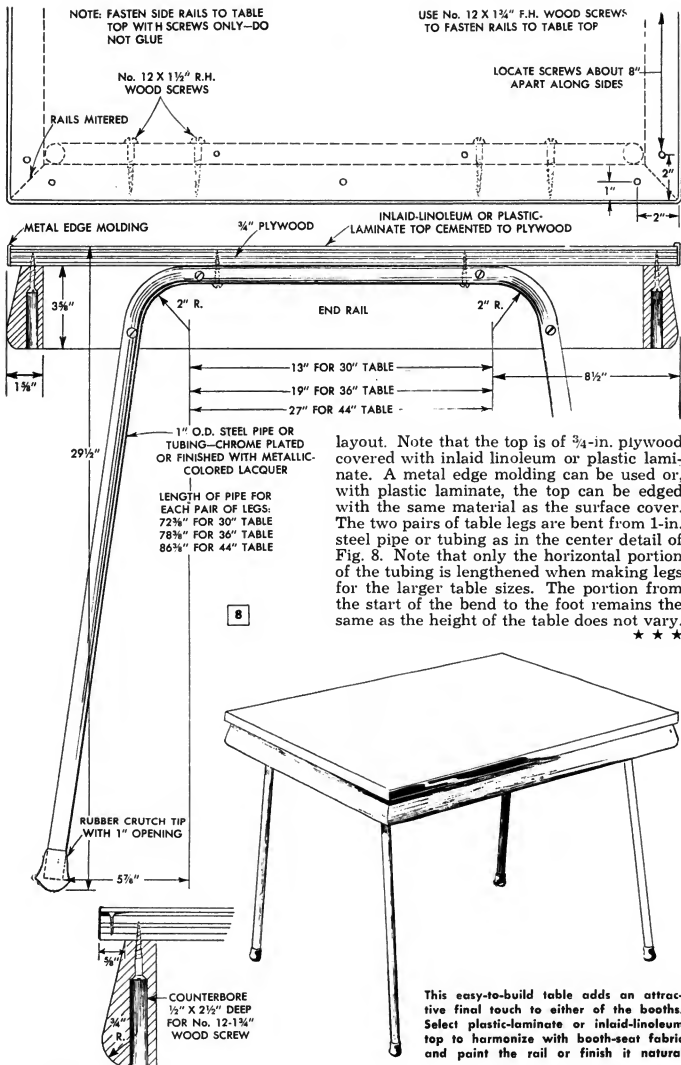
As the foam rubber cannot be tacked in place, it is held in position by means of muslin tacking strips, which are cemented to the rubber. These strips are about 3 in.



wide and run the full length of the rubber.

After applying the foam rubber, cut and fit the seat and back covers. The seat cover is tacked to the front and rear seat rails and the back cover to the top and bottom back rails. The ends of both covers are tacked to the end seat rails and back end panels. Where the ends of the unit are exposed, an upholstered end panel is made and bolted to the unit, as in the lower left-hand detail of Fig. 7. When the back of the seat is not set against a wall, it can be covered attractively with a padded channel treatment, as in Fig. 7. The channels may vary from 4 to 10 in. in width, the important point being to lay out the $\frac{1}{4}$ -in. plywood backing so all the channels will be of the same width. When estimating the size to which the fabric is to be cut, add $1\frac{1}{4}$ in. to the width of each channel, and allow an extra $2\frac{1}{2}$ in. for the length of the channels.

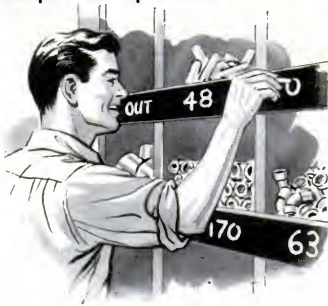
Fig. 8 details an attractive table designed especially for these booths. The table, which is extremely simple to build, can be made in a variety of sizes to suit the booth



layout. Note that the top is of ¾-in. plywood covered with inlaid linoleum or plastic laminate. A metal edge molding can be used or, with plastic laminate, the top can be edged with the same material as the surface cover. The two pairs of table legs are bent from 1-in. steel pipe or tubing as in the center detail of Fig. 8. Note that only the horizontal portion of the tubing is lengthened when making legs for the larger table sizes. The portion from the start of the bend to the foot remains the same as the height of the table does not vary.

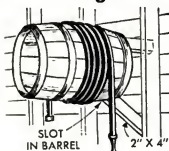
This easy-to-build table adds an attractive final touch to either of the booths. Select plastic-laminate or inlaid-linoleum top to harmonize with booth-seat fabric and paint the rail or finish it natural

Blackboard on Bins and Shelves Keeps Stock Up-to-Date



By providing small blackboards on the front of his bins and shelves, one parts manager has found it easy to keep a perpetual inventory of parts on hand. Blackboard paint is applied to the front of the bin or shelf. Whenever a part is taken out or replaced, the number on the blackboard is changed, so that the actual number of parts in stock always can be seen easily. When compiling an order for a salesman, all the manager need do is walk past the shelves and note those numbers that are low.

Small Barrel Provides Rack For Storing Garden Hose



A small barrel or nail keg, because of its relatively large radius, can be used to provide a simple rack for storing garden hose. The barrel is slotted, as shown in the detail, and two lengths of 2 x 4 are bolted together to form a bracket on the wall. In the example illustrated, the bracket also was bolted to the studs of the garage wall.

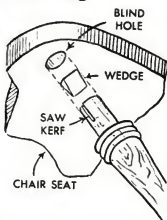
Bank Made From Plaster Figure By Cutting Slot in Top

The hollow plaster animals and figurines given as prizes at carnivals and fairs are easily converted into coin banks. Pencil the outline of the coin slot at the top of the figure, then cut it out with a pocket knife or small sharp chisel. Coat the raw edges of the slot with several coats of lacquer or shellac to prevent further powder-

ing as the coins enter it. To permit emptying of the bank, cut a hole 1 in. in dia. in the bottom of the figure and plug with a cork.—E. Jenicek, Chicago.

Wedge Assures Tight Joint When Regluing Chair Leg

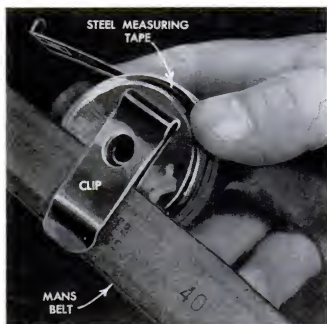
When refastening a loose leg in the blind hole in a chair bottom, use a wedge to assure a tight fit. Saw a kerf in the leg, so that it is at right angles to the grain of the wood in the seat. Then cut a wedge, the wide end of which is about twice the width of the kerf. Apply glue to the wedge, kerf and the end of the leg. With the wedge just started in the kerf, slip the leg into place. Invert the chair, support the top on a workbench or other solid surface and drive the leg into place.



Belt-Clip Prevents Misplacing Of Measuring Tape

A definite aid to prevent mislaying your steel measuring tape is this spring-clip that permits carrying it on your belt within easy reach. The clip is a narrow strip cut from spring-brass or steel, folded in half and shaped to clip over a man's belt. It may be necessary to drill or punch a hole to clear the rivet that projects from the center of the measuring-tape case. The rule should be removed from the case, if possible, when soldering on the clip.

Ken Murray, Colon, Mich.

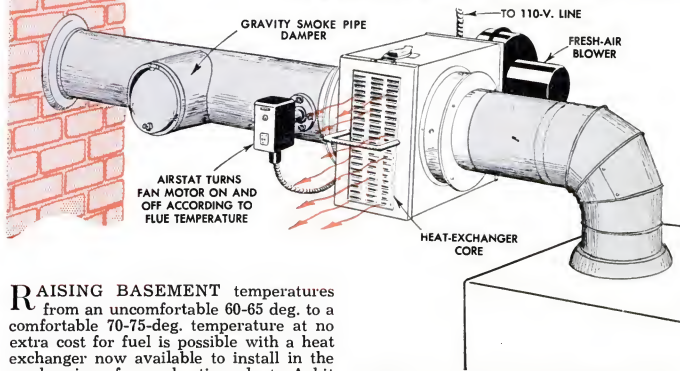


FREE HEAT FOR YOUR BASEMENT

Increase the heating capacity of your present furnace without burning more fuel. The secret is to utilize the wasted heat which normally is lost up the chimney



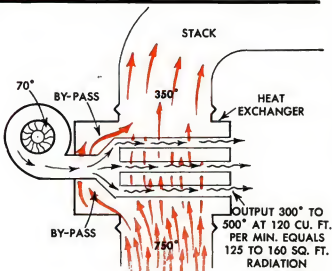
Above, the Free Heater can be installed in fairly limited space, either horizontally or vertically. Below, typical installation showing Free Heater, blower and thermostatic control for motor

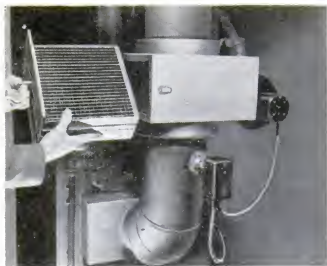


RAISING BASEMENT temperatures from an uncomfortable 60-65 deg. to a comfortable 70-75-deg. temperature at no extra cost for fuel is possible with a heat exchanger now available to install in the smoke pipe of your heating plant. A kit also is available to adapt the unit for a 4-in. round sheet-metal pipe to carry heat to an attic, a workshop, enclosed breezeway, attached garage or even to supply auxiliary heat to a room that is hard to heat.

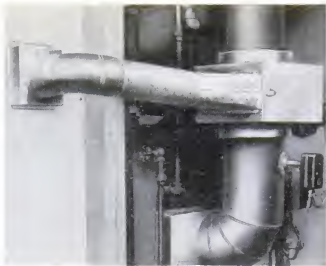
Called a Free Heater because it utilizes only waste heat headed for the chimney, the exchanger works best on oil-fired heating plants where smoke-pipe temperatures are high. It will, however, work on stoker-fired plants if the stack temperatures are 450 deg. or higher—the higher the better.

In one test case, a standard oil-burning furnace of 80,000-B.T.U. capacity showed a stack-temperature drop across the heat exchanger from 750 to 360 deg. The air forced





Heat-exchanger core is removed from Free Heater by simply releasing spring catch and pulling out drawer



Adapter kit permits use of standard furnace ducts to run heat from exchanger to other parts of house

into the basement was 460 deg. as it left the exchanger. Basement temperature, including the air entering the blower, was 68 deg.

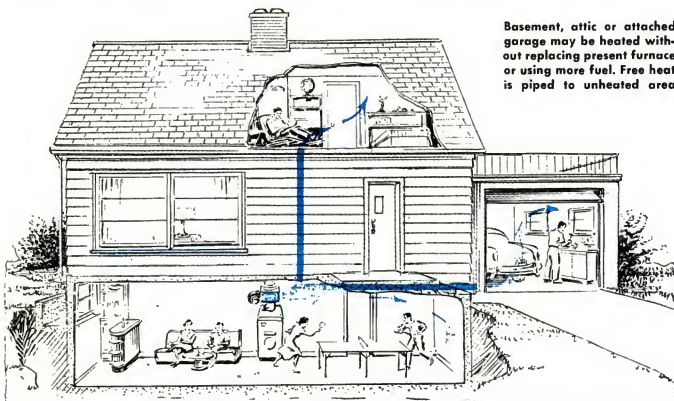
The heater should not be used where there is a possibility of lowering the stack temperature at the chimney below an amount suitable to maintain the required draft on the heating plant, which usually is a minimum of 350 to 400 deg. F.

The exchanger consists of a core of steel tubes encased in a heavy-gauge sheet-metal housing and a small 150 c.f.m. fan. When it is installed in the smoke pipe by removing a section of the latter, hot gases from the heating plant pass over the tubes of the exchanger heating the air which is blown through the inside of the tubes. A thermostatic control starts the blower in the exchanger whenever the stack temperature rises above 350 deg. Normally, the control

is installed in the pipe between the exchanger and the furnace. If lack of space makes it necessary to place the control between the exchanger and the chimney, a lower setting is used.

A safety device built into the exchanger is a bypass that allows the furnace gases to pass around the exchanger and directly into the chimney if the tubes should become clogged with soot.

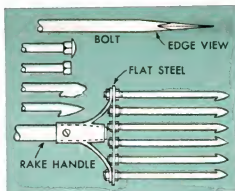
Maintenance of the Free Heater is a simple job. The steel tubes are specially brazed to withstand temperatures up to 2000 deg., far above the temperatures in a home-furnace chimney. To clean the exchanger, simply pull out the core as you would a drawer and use a garden hose to wash away the soot collected between the tubes. Under normal conditions the exchanger need be cleaned only once or twice a season.★★★



Basement, attic or attached garage may be heated without replacing present furnace or using more fuel. Free heat is piped to unheated area

Fishing Spear Has Barbs Hand-Forged From Carriage Bolts

Not being able to purchase a fishing spear in his locality, one sportsman made his own by using carriage bolts and a discarded rake handle. As shown in the detail, a length of flat steel was drilled to receive a number of carriage bolts which were forged into barbed spears. The head of each bolt was cut off, leaving the square shoulder. This was hammered to a rough shape, which then was ground to a finished point. The bolts can be worked cold, but heating the ends red hot would make the job of shaping with a hammer considerably easier. The finished barbs were then bolted to the drilled flat



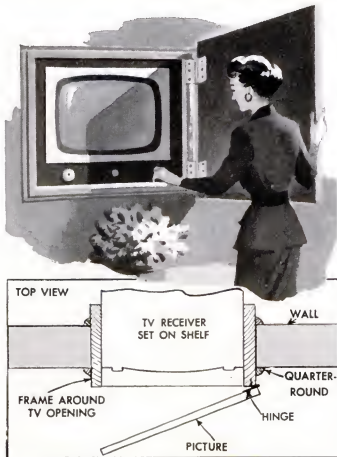
steel and assembled on the rake handle. If a heavier handle is desired, pipe or tubing can be substituted for the rake handle.

Jack Voegler, Muskegon, Mich.

Picture or Mirror Conceals Television Set in Living-Room Wall

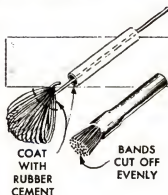
One method of gaining more floor space in the living room is to install the TV set in the wall. A large picture or wood-backed mirror then can be hinged to cover the set when it is not in use, thus maintaining the effects of your interior decorating. An installation of this kind will require that there be a closet or other room not affected by the set projecting through

the wall. The studs of the wall are cut and double headers nailed in place, as would be the case when installing a window. A sturdy, well-braced shelf is built to hold the set, so that the TV screen and controls are nearly flush with the living-room wall. Ample ventilation must be assured, to carry away the heat generated by the set. For purposes of repair there should be easy access to the back of the set.

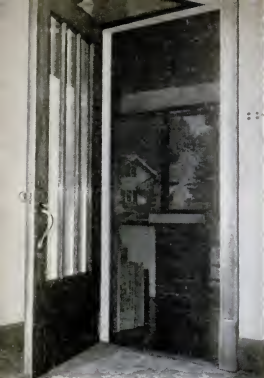


Rubber Brush for Soldering Acid Made in a Few Moments

An all-rubber brush for applying soldering acid can be made in a few moments from a short length of thick-wall rubber tubing and some small rubber bands. Rubber cement is smeared inside the end of the tubing and also



over the rubber bands, which are hooked over a bent piece of wire, as shown. The rubber bands are stretched taut and then pulled into the tubing with the hooked wire. When the tension is released, the tubing becomes slightly distended as the bands expand. This pressure, plus the cement, holds the bands firmly in the tube. Cut the doubled ends of the bands off with a shears at the desired length.

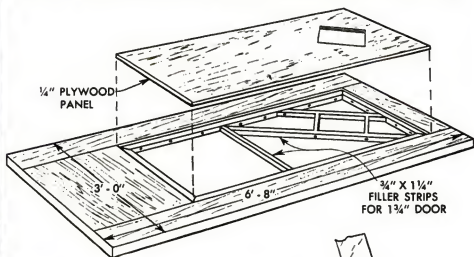


Above, old-fashioned glass-paneled door before remodeling job

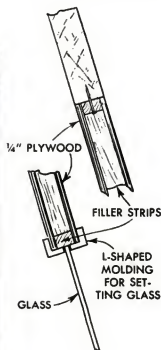
NEW FACES FOR OLD DOORS

By Henry and Vera Bradshaw

AN OLD-FASHIONED glass-paneled entrance door that gives no privacy and is a constant decorating problem, can be remodeled into a modern panel door at moderate cost in a couple of hours. Unless new hinges are used which require being mortised into the edge of the door, no refitting is necessary. To remodel the door, first remove the glass and molding. Next, nail filler strips around the inside edge of the opening so that $\frac{1}{4}$ -in. plywood panels will come flush with the surface of the door. Measure the opening and cut a plywood panel for each side. The window is located by first temporarily fitting one of the panels in place and marking off the center line of the door. Then the window opening is laid out and the openings are cut in both panels at one time. Filler strips are added around the edges of the cutouts and the panels are glued and nailed into place. The glass for the window is held in place with L-shaped molding. The door is finished by filling in all joints with wood putty.



Above, assembly before refinishing. Below, door is filled, sanded, painted white



Emergency Reflector for Light Made From Large Funnel

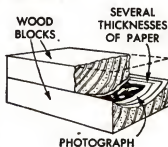


One homeowner used a large funnel as a shade on an improvised light over the workbench in his basement. As an emergency measure, until he found time to install proper lighting over the bench, he used a standard trouble light suspended

from a hook. By pulling a loop of the cord through the funnel as shown, he was able to use the funnel as a shade without taking off either the receptacle or the plug of the cord. As a safety precaution, he lined the funnel with electrical tape to prevent contact between the two metal surfaces.

Curled Photographs Flattened Between Curved Blocks

Snapshots that have become curled to the extent that they are difficult to handle and file, can be flattened by pressing them between two curved blocks to reverse the curl.



The two blocks are bandsawed from one piece of solid stock and the curved faces sanded smooth and covered with several thicknesses of paper to protect the photos. Place a weight on the top block or snap heavy rubber bands around both blocks to hold them together.

Salvaging Clogged Sander Belts

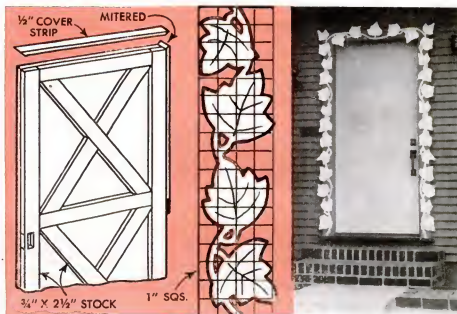
Instead of discarding a sander belt that has become clogged with resin, varnish, paint or glue, rinse it lightly in lacquer thinner. Then go over the belt with a wire brush to finish the job.

Henry Josephs, Gardenville, Pa.

Door Framed in Scrolled Garland Brightens Drab Entrance

To highlight the drab-looking entrance to his house, one homeowner replaced the old door with a new flush-panel, and then framed it with a scrollsawed garland of leaves, as pictured. The leaves, cut from $\frac{1}{4}$ -in. exterior plywood, are nailed directly to the frame and painted a light-green color, to contrast with the dark green of the house. He also made the flush-panel door himself. The door consists of plywood panels glued and nailed to a frame of $\frac{3}{4}$ x $2\frac{1}{2}$ -in. stock. Upper and lower portions of the frame are strengthened with X-braces. The outside panel is of $\frac{1}{2}$ -in. plywood, while $\frac{3}{4}$ -in. plywood is used for the inside panel. When figuring the dimensions of the door, allowance should be made

for $\frac{1}{2}$ -in. cover strips at the top and sides. It is best to use exterior-grade plywood for both panels. The garland of leaves can also be used around the windows or on the house eaves.—Hi Sibley, Nuevo, Calif.



Solving

HOME PROBLEMS



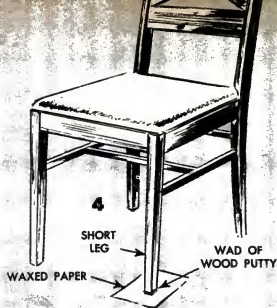
① **PORTABLE DRYING RACK** for drying small articles of clothing over register or radiator is provided by folding screen fitted with removable dowels. Screw hooks are driven into ends of dowels which are hooked into screw eyes in edges of screen

② **SPARKLING-SILVER NUT CUPS** for party place settings can be made easily by hand-forming aluminum foil over bottom of a small glass jar or tumbler. Shape the foil carefully so it does not tear, remove it from the glass form and trim edge with scissors

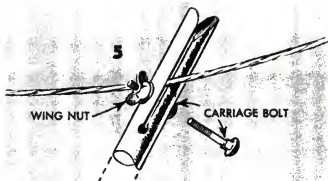
③ **RUBBER GLOVES** will have a longer useful life if tips of the fingers are protected from sharp fingernails. Simply place a small pad of cotton inside the tip of each finger so that the soft rubber will be protected when the gloves are pulled on tightly



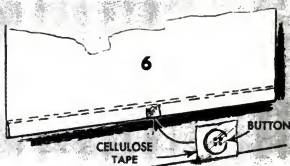
- ④ **LEVEL A WOBBLY CHAIR** by sticking wood putty on the short leg. Clean and sand bottom of leg and place chair on level surface with waxed paper under leg. Put wad of putty under leg and weight chair until all four legs contact floor evenly. Trim off excess putty and sand it when dry.



- ⑤ **THE PROBLEM OF clothesline props** that slip on the line and allow the clothes to drag on the ground can be solved by slotting the end of the pole like a clothespin and fitting it with a carriage bolt and wing nut. The hole for the bolt is drilled near the bottom of the slot.

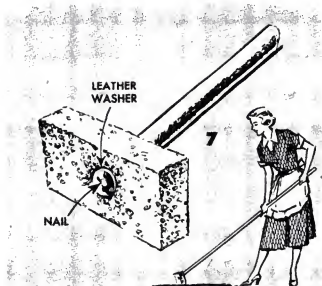


- ⑥ **IF THE WINDOW SHADE** in the kitchen or bathroom is not fitted with a pull string or tab, you can improvise one by taping a large pearl button to the edge with cellulose tape. The button provides a comfortable finger grip and the cellulose tape prevents soiling from wet fingers.



- ⑦ **A HANDY MOP** for wiping up small puddles of spilled liquids is made by nailing a cellulose sponge to a discarded mop or broom handle; use a leather washer under the head of the nail. The sponge readily washes clean and will not drip if it is not wrung out immediately after use.

- ⑧ **HAND DISCOMFORT** caused by the string handles of heavily loaded shopping bags can be eliminated by using a 5-in. length of broomstick as a handle. A groove is cut around the stick near each end to receive the string. When not in use, the handle can be carried in pocket.

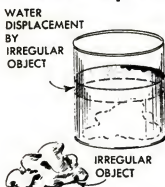


Rubber Hose Protects Shins Against Bruising on Ladder



Painters, paperhangers and others who do much of their work from a stepladder, can prevent bruising their shins by padding the steps of the ladder. The padding consists of a length of garden hose which is split and slipped over the edge of the step as shown in the illustration. Tacks or small nails can be used to hold the hose in place. The hose will not interfere with the normal use of the ladder and will give an added safety factor by making the steps slipproof.

Volume of an Irregular Object Measured by Water Displacement



cu. in.) into a container which has straight vertical sides. Measure the height of the water with a rule graduated in tenths of an inch. Next, place the object to be measured alongside the container and add enough water to bring the level above the object, to assure there will be sufficient water to cover it. Add enough water so the total height will be an even number. Example: If the pint of water measured 3

The volume of an irregular object can be determined by measuring the amount of liquid it will displace in a container of known dimensions. First, using a measuring beaker, pour exactly one pint (28.875

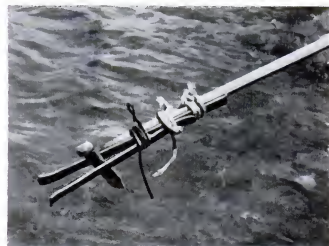
in. and the object was slightly more than 2 in. higher, add 3 in. of water. Thus, the total volume of water is now two pints or 2×28.875 . Now place the object in the water and measure the final height of the liquid. Suppose it measured 10 in.; then the ratio of the volume of the object is to 10 in. as 2×28.875 is to 6 in. Another way to figure it would be to consider that the additional 4 in. is $\frac{2}{3}$ of 6 in. (or 2×28.875 .)

Rubber Pad Keeps Pastry Board In Place on Counter Top

Many modern kitchen counter tops and tables have a hard, smooth surface that permits a pastry board to slide around when it is used for rolling pie crust. To overcome this, place a sheet of sponge rubber or a section of inner tube under the board.



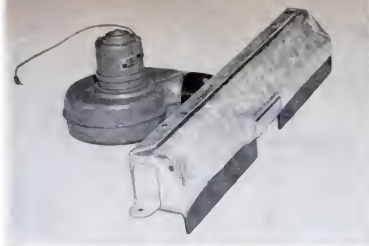
Tire Irons Lashed to Long Pole Retrieve Knife From Lake



When one fisherman dropped a knife over the side of a boat, he recovered it by using a tool consisting of two tire irons lashed to the end of a pole. The irons were tied so the slight bend at the end of each iron faced out, thus creating a "jaw." The clear water of the lake permitted slipping the jaw over the knife and the natural spring of the irons clamped it tightly, permitting it to be drawn to the surface.

Harold L. Monroe, Lomita, Calif.

Freezing fruit juice in the refrigerator tray will provide ice cubes that can be used in the juice without diluting it.



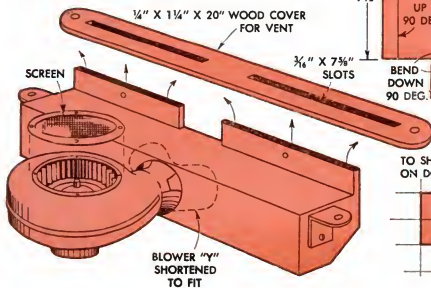
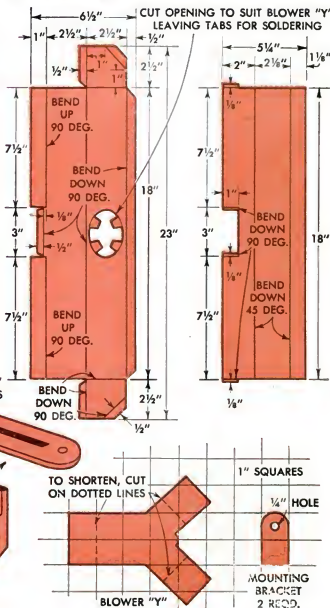
Above left, defroster before installation. Above right, finished job as it looks from passenger compartment

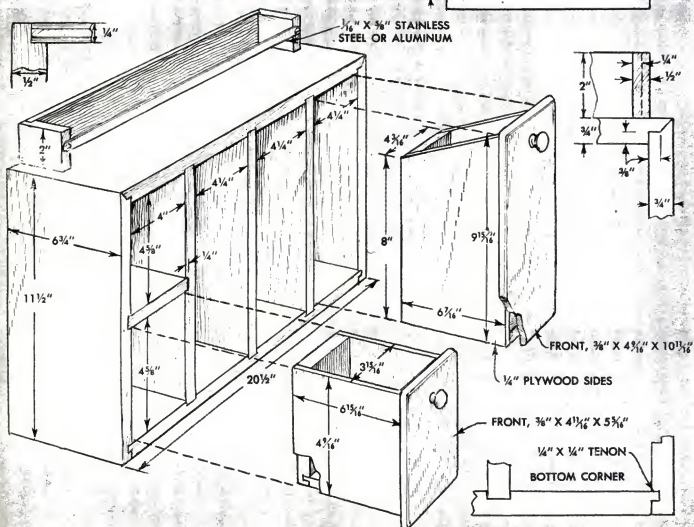
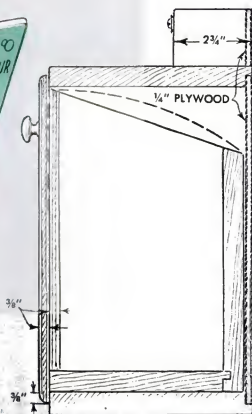
Build Your Own REAR-WINDOW DEFROSTER

A FOGGED OR FROSTED rear window—a common problem in modern automobiles with their large areas of glass—can be completely eliminated by this inexpensive defroster. Air from the passenger compartment is recirculated and forced across the full width of the window. The size of the defroster duct, which is formed from light sheet metal, will depend on the space available under the “package shelf” in the trunk. After the blower “Y” is shortened as indicated and soldered into the opening in the duct, the blower is fastened to the trunk. An angle bracket at each end of the duct permits the assembly to be bolted to the package shelf. A screen-wire cover is fitted over the blower intake and a slotted strip of wood fits over the exhaust vents. Besides clearing the back window, the defroster assures better distribution of heated air in the car.



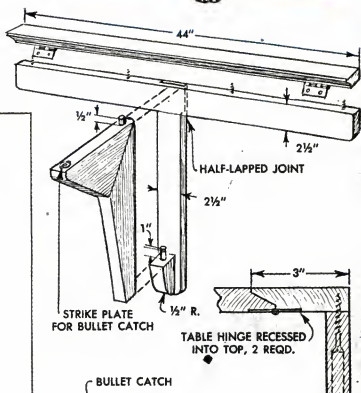
Above, installed duct and defroster seen from trunk



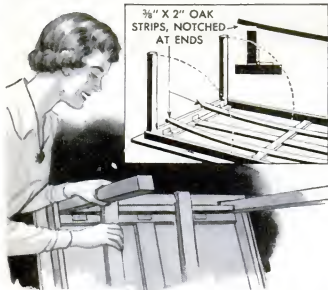




2—Table hinges
1—Bullet catch and striker

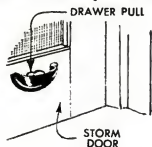


Oak Strips on Folding Table Lock Legs in Place



A simple yet positive device for locking the legs of a folding table in the vertical position utilizes two oak strips, $\frac{3}{8} \times 2$ in. The strips are cut long enough to extend beyond the table apron on two sides, and the center of each strip is screwed to the crosspiece under the table. Each set of two legs and apron is made as a unit and hinged to the table top. As shown in the detail, notches are cut in the strips to engage the apron when the legs are at right angles to the table top. The natural spring of the wood will hold the legs and apron in position. A slight pull on the strips will release the apron to permit folding the legs.

Coin Caddy for Door



For those people who leave money between their storm or screen and inner door to pay the milkman or paper boy, this coin caddy is recommended. It consists of an ordinary steel crescent drawer pull mounted upside down, either on the door itself or on the doorframe. Change can be removed easily from the holder because of its cup shape and convenient width.

Thomas P. Ramirez, Fond du Lac, Wis.

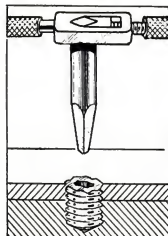
Wetting Agent Flattens and Cleans Curled Photo Negatives

A drop of concentrated wetting agent applied to both sides of a curled negative just before prints or enlargements are made will flatten it out, eliminate any brit-

tleness, and clean it all in one operation. There are a number of such wetting agents available from photo-supply houses. After applying the liquid, rub lightly with a lens tissue to eliminate any streaks. The coating will not register when the photo is printed.—Robert C. Florian, Chicago.

Tap Used as Screw Extractor When No Tool Is Available

When no screw extractor of the proper size is available to remove the broken-off portion of a small screw, a discarded small-size tap can be used to do the job. The tap is ground to a triangular point, then driven lightly into a hole drilled in the broken screw. A tap wrench placed on the tap is used to back out the screw.



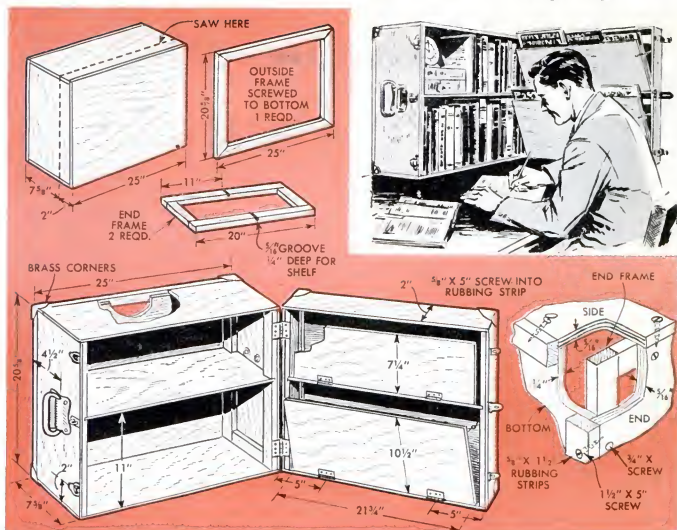
E. J. Gilkerson, Columbus, Ohio.

Locking Reflectors to Stands

No doubt every photographer who works with spot and photoflood reflectors has experienced the nuisance of lifting the reflector in moving a light about, only to have the stand drop off due to loose thumbscrews. To overcome this trouble, I drilled an oversize registering hole in the upper end of each stand to take the end of the thumbscrew. Thus, even if the thumbscrews should work loose, they will still engage the stands and keep them from dropping off accidentally.



Portable Bookcase Doubles as Shipping Box



Students and others who find that packing books in a suitcase is very unsatisfactory will appreciate this traveling bookcase. With the lid closed, it is an ideal shipping crate for about 35 books. With the lid open, the case can be set on a table, where it becomes a bookcase and magazine rack. To begin construction, make the box shown in the upper corner of the detail and saw the top off. Then the inside and outside of the box are braced with the frames shown.


Before installing, the inside end frames are grooved to take a shelf. They are installed first, and then the bottom frame is put on the outside. Screws are driven through it into the end frames. Screws also are driven into it at an angle through the box sides. The lid is braced with two 2-in. boards which also are grooved for a shelf. Partitions are hinged to the lid, as shown, and then the lid is attached to the box.

John C. Wilson, Ottawa, Ont., Can.

Filaments of Flash Bulbs Tested With Dry Cell and Earphones

If there is any question as to the age and condition of photoflash bulbs, the filaments can be tested by using a single dry cell borrowed from the camera's flash gun and a single or double set of radio earphones. Clip one of the earphone leads to a contact on the dry-cell case and touch the other lead to the metal base of the bulb as the bulb is held in contact with the terminal of the dry cell. An audible click in the earphones indicates that the filament is unbroken and will fire. No sound indicates that the filament is broken and the bulb is defective. — Robert Hertzberg, Jackson Heights, New York.





HOW TO SHOOT OVER DECOYS

By Shep Shepherd

A FLOCK OF DUCKS or geese swinging in to the decoys is a sight to delight the eye of any wildfowler. On marginal feeding grounds near big flyways and in marshes, ponds and lakes, birds usually must be decoyed within range for consistent shooting. Jump and pass shooting, although preferred by some wildfowl hunters purely because of the skills involved, do not always produce satisfying bags, except for those exceptionally skilled in shotgun handling.

Most wildfowlers put out at least a dozen duck decoys unless shooting over a very small marsh or pond where a big flight would not ordinarily land. In making duck-decoy sets always keep in mind that for the surface feeders such as mallard, pintail, teal and others, the decoys should be placed so that the birds can swing in and land outside the set.

Decoys for geese should be of the full-bodied type with detachable heads which can be placed in any one of several positions so that the individuals in the set appear to be feeding in a natural manner. Make set in stubble or grain fields near resting grounds birds are known to frequent

A typical decoy set for geese with individuals in natural poses and some distance from traveled roads and fences. All feeding flocks are watched over by a sentinel. Don't forget the sentinel when putting out the decoy set. Locate this individual at some distance from flock, on a rise if possible





A typical duck-decoy set with live birds coming in for a landing. Note especially position of individuals

The divers, which include upwards of a dozen species, usually come directly in to the decoy set and for this reason it's a good idea to keep the individual decoys more widely separated. The decoy set for the divers also should be placed over deeper water than that for the surface feeders, or puddlers.

Another thing to avoid is regularity in the set formation. This can be done by changing the anchor point on several of the individual decoys so that they will ride quartering or side to the wind. This arrangement will make the set appear more natural. When coming in to the decoys, ducks usually will land directly into the wind or quartering it. They rarely come in without circling the set at least once, even in rough weather, more often two or three times. Pick your shooting position with this in mind. Generally the best shots

are afforded when the decoy set and shooting position are arranged so that ducks coming in to the decoys will pass in front of the blind, quartering across the line of vision from the right or left. However, selection of the shooting position is more or less a matter of individual preference and, of course, is determined to some extent by the nature of the shooting grounds.

If there has been much shooting in the locality, leaders of the flocks will be unusually wary. When this is the case there are several simple tricks that will often bring them in. Four to six individual decoys grouped a short distance from the main set may

Below, left, pebbles thrown into quiet water will form ripples like those made by feeding ducks. Right, body-form decoys of the type which can be nested for convenience in transporting





Self-inflating rubber decoys are set simply by tossing into the air over water. Colors are impregnated and won't wear off



Above, large paper napkins make good decoys for snow geese. Twist one corner for head and neck and tuck two opposite corners under small stones. Below, a well-arranged decoy set appears remarkably realistic when viewed from near-by blind



Change anchor points on several decoys to make them head in different directions

fool them. These individuals should all be of one species and should face the set. When there are no wind ripples on the water to give the decoys the appearance of motion, a wise old leader may become suspicious. Frequently you can deceive him by tossing several small pebbles into the set. These will cause ripples in the smooth water like those made by feeding ducks.

Use a duck call sparingly and then only to attract flights passing at some distance. If they swing to the call, stop calling as soon as you know they have located your decoy set. Should they waver and draw away you may be able to bring them in again with the call. You must remain well hidden in the blind while a flock is circling the set. If they suddenly tower and swing away, you can be sure the leader has spotted you. Repeated calling is not likely to bring him in again.

The best decoys for geese are the full-bodied type with detachable heads and necks which can be turned into any one of several natural positions. A typical set made near the feeding ground is pictured in one of the photos. Geese always feed into the wind or slightly quartering and there is always a sentinel on guard. Usually he will be some distance from the feeding flock and on a rise of ground. Don't forget to include the sentinel in your decoy set. When possible the set should be made in an open field, away from roads and fences. Make the set early, before daylight if possible. In some localities, shooters make decoys for snow geese from large



Close-up of paper-napkin decoys. Note realism when viewed from near by. Sentinel decoy in foreground

white paper napkins. Tuck the opposite corners under small stones and then twist one corner to resemble the head and neck. These decoys are pictured in accompanying photos and are rated quite effective by experienced hunters. As a rule it's better to move the decoys to a different feeding ground after a day's shooting. How far or where depends on the nature of the feeding grounds. Your best procedure is to



Wooden decoys should be packed individually in heavy paper bags for transport. Bags keep them clean

study the feeding habits of the birds in a given locality beforehand. Then you will be able to plan decoy sets and the necessary blinds or pits with a minimum loss of time. Provisions for adequate cover are important. The blind or pit must be so constructed as to enable you to remain concealed for long periods of time. Once geese start moving to the feeding grounds shooters must remain hidden. ★ ★ ★

Under some conditions, artificial camouflage is effective, especially when nothing is at hand for suitable blind

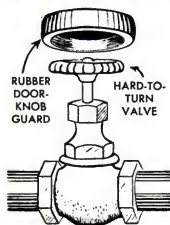


Template With Dowel "Comb" Eases Job of Cutting Hedge



The job of trimming a hedge can be made much less tedious by the use of a plywood template. A piece of $\frac{1}{2}$ -in. plywood is fitted with $\frac{1}{2}$ -in. dowels, as shown in the detail, to provide a "comb" which holds the leaves and branches ahead of the template. The two outside dowels are set at a slight angle to help pull in stray branches. The hedge is clipped even with the top of the dowels. A piece of hard-board nailed at right angles to the adjacent edge of the plywood aids in keeping the comb in line, and permits the template to be tipped on edge to aid cutting the sides of the hedge. Drawer pulls can be screwed to the plywood for easier handling.

Valve Turned With Rubber Grip



Water valves which are not often operated become difficult to open and close, and it can be painful to grip the valve handle tightly enough to turn it. A rubber doorknob guard, slipped over the handle, will overcome this problem.

Freeze Paint Roller Between Jobs

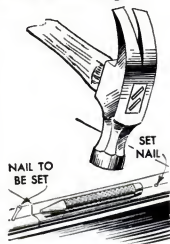
A paint roller that has been used to apply water-mixed paints can be prevented from hardening between jobs if you keep it in the freezing compartment of your refrigerator. Rinse as much of the paint as possible from the roller, wrap it in wax

paper, and freeze it. To get it ready for use again, drop it in a pan of hot water for several minutes to thaw the paint.

F. S. Tobey, Sharon, Mass.

Nail Set Used at Right Angles Prevents Damage to Flooring

A trick used by some professionals will help you speed up the job of laying tongue-and-groove flooring and reduce the chance of damage caused by the nail set slipping off the nails. First, the round-shank nail set used must be of fairly small diameter. The nails are driven and set



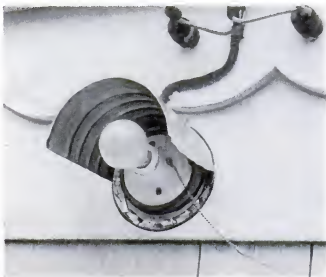
as far as is possible without risking damage to the wood. Then the set is placed lengthwise across the nail head in the angle of the tongue and edge of the floor. A few sharp blows on the set will drive the several minutes to thaw the paint.

Witten V. Brady, Spokane, Wash.

Protector for Back-Yard Light Made From Gallon Can

A protector for a back-yard light that will also act as a reflector can be made from a 1-gal. can. Cut the sides of the can with a tin snips so that $\frac{1}{2}$ to $\frac{3}{4}$ of it will cover the light, after first removing the top with a rotary can opener. A hole is cut in the bottom of the can large enough to permit passage of the wires. Then the socket is mounted over the bottom of the can, as shown, so that the screws which hold the socket in place also hold the can.

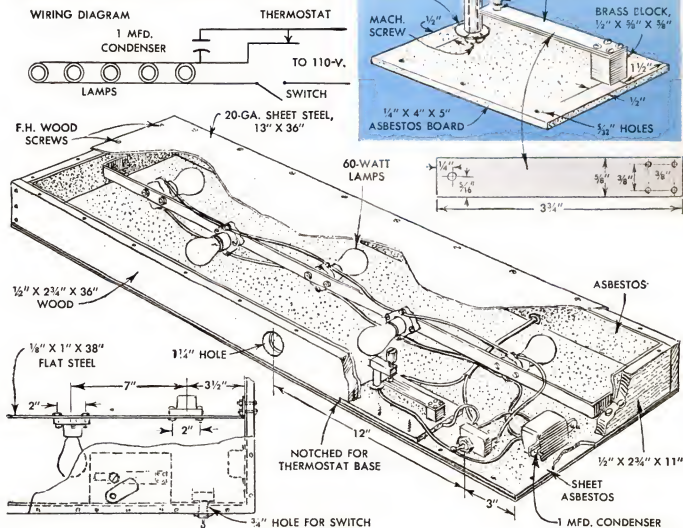
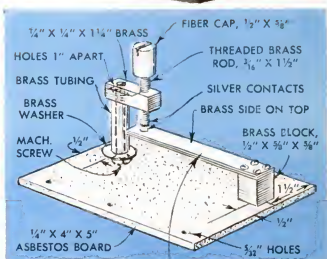
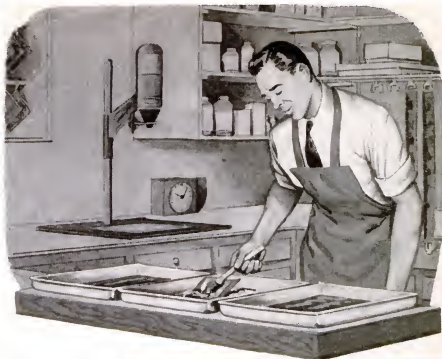
Don Honick, Chicago.



Electric "Hot Plate" Warms Photo Developer

By Walter B. Ford

THIS IMPROVED electric heater solves the problem of maintaining developing solutions at a uniform temperature in the home darkroom. An adjustable thermostat provides a range of temperature controls to meet varying conditions. The detail below shows how to build the box-type frame and line it with sheet asbestos. Porcelain lamp sockets are mounted on a length of flat iron bent and screwed to the ends of the box as shown. The thermostat is built as in the detail at the right, using a bi-metallic strip and silver contacts. The fixed thermostat contact is soldered to a screw fitted with a slotted fiber cap which is adjusted through an access hole drilled in the sheet-metal cover. A condenser and a single-pole toggle switch are provided. Drill a 1/4-in. hole in the side of the frame to permit air circulation.



Pull-Out Trash Bin Under Bench Easily Removed for Emptying



A trash bin that pulls out from under the workbench to receive shavings and other debris from the bench top can be made easily from $\frac{1}{4}$ -in. plywood. After the bin is assembled, following the lines in the drawing and made for the individual bench, it is hinge-supported at the bottom by means of a 1-in. dowel inserted through the bottom of the box. The ends of the dowel rest in notched blocks that are nailed to the floor, allowing the box to be lifted out.

Photo-Solution Trays Warmed By Strip-Type Heaters



When a dark-room is so cool that a tray of developer must be heated to bring it to correct temperature, it is advisable that all processing solutions be warmed to the

same degree to prevent reticulation, the webbing or wrinkling of the emulsion, caused by sudden temperature changes.

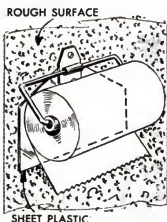
Ventilation for the Kitchen . . .

Cooking odors and smoke from frying will be a thing of the past in your kitchen after a kitchen vent fan is installed. And the kitchen will be more comfortable in the summer months, when the fan will remove the excess heat. Learn all about kitchen ventilating fans—from the advantages of each different type to how to install one—in the story to be featured in next month's issue

Three or four trays, or tanks, can be heated at one time by merely resting them on a strip-type electric brooder heater. The heater strips come in lengths of 23 in. and are available in 100, 200 and 300-watt ratings. The cost is less than a dollar for each unit.

Plastic Sheet Under Tissue Roll Permits It to Turn Easily

When a sand-finish or other rough-surfaced wall behind a roll of tissue does not permit the roll to turn properly, a small sheet of clear plastic attached to the wall will provide a smooth and inconspicuous surface on which it will turn easily.



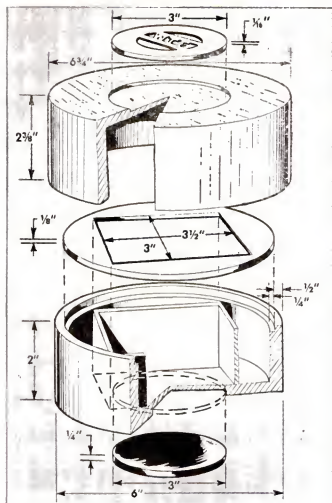
The plastic should be slightly wider than the roll and should extend to a point just below where the roll contacts the wall. To attach the plastic to the wall, loosen the screws of the roller bracket, insert the plastic under the base, and then tighten the screws.

Arrow on Valve Handle Helps Adjust Blowtorch

A small arrow or other mark painted on the valve handle of a blowtorch will aid in preventing damage to the needle valve. Besides indicating when the valve is almost shut, the mark also will act as an indicator when adjusting the flame. The arrow should point straight up when the valve is closed.—Richard Hanscom, Elmhurst, Ill.



Turned Cigarette Box Has Monogrammed Lid



By R. J. DeCristoforo

Consisting primarily of two "pillbox" wood turnings, this attractive cigarette box is a fairly simple project that can be completed over a week end or in a few nights in the workshop. The cover and the body of the box are turned from maple, while the inner box that actually holds the cigarettes is made of walnut or mahogany for contrast. The block for the body is mounted on a faceplate and turned to size, then recessed 1/4 x 3 in. on the bottom to receive a disk of sheet lead which is used to weight the body and keep it from lifting when the cover is removed. After the recess is made, the body is removed from the faceplate and held in a wooden chuck for turning out the inside and forming the 1/8 x 1/4-in. rabbet around the edge. Next, the cover of the box is turned to size and hollowed out. If the fit between the body and the cover is snug enough, the body now can be used as a chuck to hold the cover while the recess for the metal inlay is turned in the top. When the cover is completed, both it and the body are sanded until they are a good sliding fit with each other. The inner cigarette box is formed of 1/8-in. stock butt-jointed and glued together, after which it



Below, recess is turned in the bottom for a lead weight which is tacked in place and covered with felt



is glued inside the base. The frame of the inner box, which is a disk with a rectangular opening cut from the center, may be shaped on a jigsaw, then sanded or filed to fit snugly into the rabbet in the body. The metal inlay for the top of the cover may be of aluminum, brass or copper. A disk of the metal is cut to provide a press fit in the recess of the cover, then a suitable monogram or design is scribed on it. The design is cut out with a jeweler's saw or jigsaw and the inlay is fastened to the cover, either by simply cementing it or riveting it through the cover with soft rivets. Fill in the fretwork of the inlay with wood putty, allow it to dry, then sand it flush. As shown, the lead weight on the bottom of the body is tacked in place.

Ammonia Helps Remove Tip Of Soldering Iron

Until recently I have spent considerable time in removing the copper tip of my soldering iron when it was necessary to replace it. Then I discovered that by putting a small quantity of household ammonia around the tip and in the recess, I could remove the tip in just a few seconds.—Arthur M. Greshamer, Sr., Columbus, Ohio.

Stepladder Provides Sawhorse When None Is Available



When you need a sawhorse and none is available, an open stepladder laid on its side will serve as a substitute. Though it is not as high as a horse and will be a little less convenient to work with, it will be a help when sanding, sawing or painting. It is especially useful on jobs where you need both a ladder and a sawhorse.

Cause of Scratched Film Removed By Polishing Camera Interior

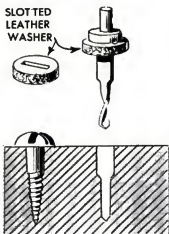
If developed films are consistently returned from the photofinishers with scratches on them, check the inside of your camera for rough spots that are causing the trouble. First, examine the negatives under a bright light to determine whether the front or back of the film is being scratched. If the scratches are very fine, drag a needle point gently across the negative; the tiny irregularities can be felt. After determining which side is being

scratched, examine that side of the inside of your camera with a magnifying glass, going carefully over every point which the film strip contacts as it is wound in the camera. Wherever rough spots or burrs are seen, rub them down with crocus cloth and polish with jewelers' rouge. Cover the lens with tissue as protection against the abrasive. Also, if the black paint is rubbed off, repaint it.

Philip E. McCafferty, Fort Bliss, Tex.

Modified Combination-Type Drill Used for Roundheaded Screws

The combination-type drill that bores, in one operation, a pilot and shank hole, plus a countersink, for a flat-headed screw, can easily be adapted to drill holes for round-headed screws. Cut a leather washer and slot it, as shown in the detail, to slip over the bit and under the shoulder of the drill.

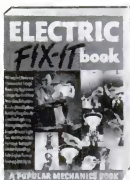


The leather should be just thick enough to cover the blades of the countersink, thus permitting the drill to bore a hole of full depth.—Andy Vena, Philadelphia, Pa.

❑ Friction tape will unroll more easily if an X is cut lightly with a razor blade on both sides of the roll to sever any strings stuck together along the edges of the roll.

Walter M. Shutok, Uniontown, Pa.

Popular Mechanics Bookshop



Electric Fix-It Book

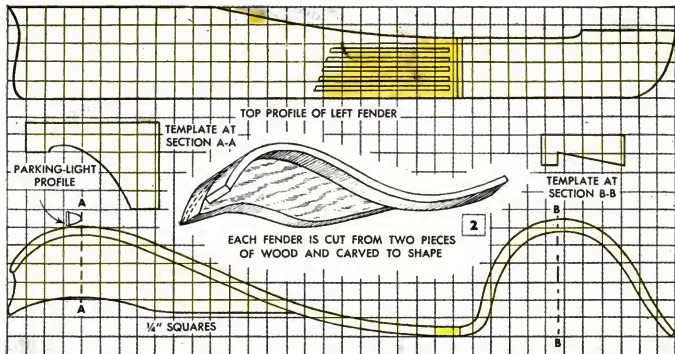
There are scores of hints and kinks that will aid you in repair of electric outlets and home wiring in this book. There are instructions for lighting up your back yard and a number of special ways to make useful items around the home. In cloth binding only \$2.00.



Planning Your Home Workshop

Here is a book that shows you just how to set up a shop on a limited budget, how and where to get the tools you will need and want, explains the basic big six power tools, gives floor plans and layouts to suit your space requirements. Over 160 pages 250 photos only \$2.50.

All books available from Popular Mechanics Book Dept., 208 E. Ontario St., Chicago 11, Ill.

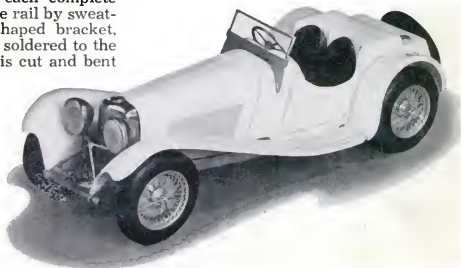


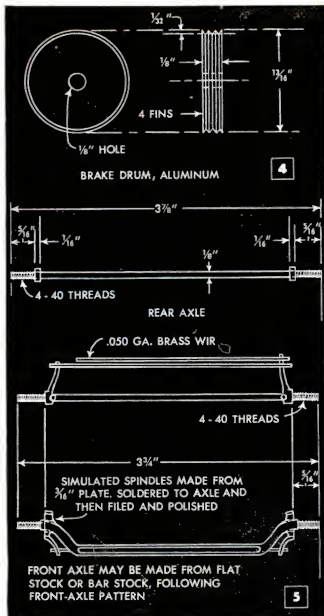
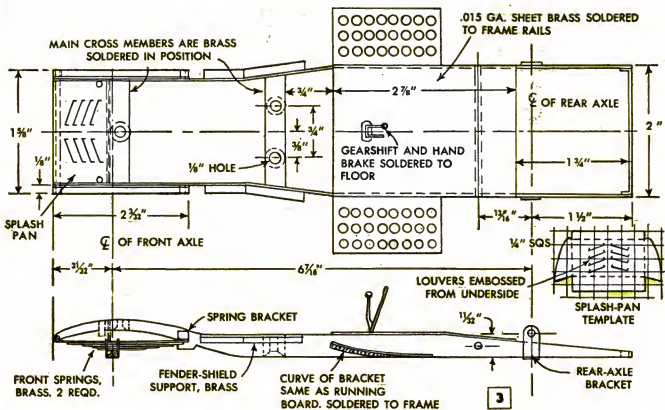
as the floor board and measure $\frac{7}{8}$ in. wide and $1\frac{3}{4}$ in. long. In referring to the profile view, Fig. 3, notice that these supports are curved to match the curvature of the fenders, and are soldered to the side of the rails at a point even with the leading edge of the floor board. Holes in the running-board supports provide a strong bond in cementing them to the fenders. The two supports for the fender shields are formed from .015 sheet brass. Each one is bent to an L-shape from a $\frac{1}{4} \times 1\frac{1}{16}$ -in. strip by bending it down the center to produce a $\frac{1}{8}$ -in. angle. A V-gusset is made in the top of each angle to make it conform to the shape of the side rails. These are soldered in place $\frac{1}{16}$ in. forward of the floor board and flush with the top of the side rails.

The top leaf of each front spring is made from .015 sheet brass, $\frac{1}{8}$ in. wide and $2\frac{1}{4}$ in. long. One end of each leaf is rolled to form a small eye to hook over the ends of the tubular cross member. Four more leaves of varying lengths are soldered to the top leaf, after which each complete spring is fastened to the side rail by sweat-soldering it to a tiny L-shaped bracket, $\frac{3}{32} \times \frac{1}{4}$ in. This, in turn, is soldered to the rail. The front splash pan is cut and bent from sheet brass, $1\frac{1}{2} \times 2\frac{1}{2}$ in. A full-size pattern should be made for this by enlarging the squared drawing given. Three sides of the pan are bent upward on the dotted lines, while the front edge is bent downward somewhat to form a slight lip for hooking over the tubular cross member. Simulated louvers in the bot-

tom of the pan are formed by embossing the metal from the underside with the end of a hardwood stick. The pan fits between the side rails flush with the top where it is sweat-soldered in place. Two short lengths of brass tubing, $\frac{3}{32}$ in. in dia. and $\frac{1}{4}$ in. long, are soldered vertically to the sides of the pan, one on each side, to provide sockets for the headlight brackets, detailed in Fig. 8. The rear-axle mounting brackets are shaped from .053 brass and measure $\frac{1}{4}$ in. wide and $\frac{9}{16}$ in. long. Holes are drilled in the rounded ends for the $\frac{1}{8}$ -in. rear axle, detailed in Fig. 5. The brackets are sweat-soldered to the outside of the rails, centering them on a line $1\frac{1}{2}$ in. from the end of the chassis. This leaves fitting the rear tubular cross member, which is $\frac{1}{8}$ in. in dia. and 2 in. long, in the holes previously made in the side rails, and soldering the wire gearshift and hand brake to the floor board.

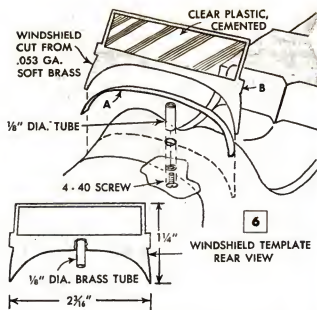
Figs. 4 and 5 detail the front and rear axles and brake drums. In the case of the rear axle, a 4-40 thread is run back $\frac{1}{16}$ in.





from each end of a $\frac{1}{8}$ -in. brass rod. The brake-drum stops, or collars, which are drilled to slip over the ends of the axle, are sliced from $\frac{3}{16}$ -in. brass rod into tiny disks $\frac{1}{16}$ in. thick. These are drilled and spot-soldered at the ends of the threaded sections after the axle is installed. The front axle consists of an "I" beam shaped from $\frac{3}{16}$ -in. brass rod approximately 4 in. long. This is chucked in a lathe and each end is turned to a .115-in. dia. for a distance of $\frac{3}{16}$ in. The turned portion at each end is then threaded with a 4-40 thread as was done on the rear axle. The brass rod is now annealed to permit it to be bent to the shape shown. To anneal brass, heat it to a cherry red and then quench it immediately in water. Steering knuckles and brake-drum stops are shaped from $\frac{1}{8} \times \frac{1}{4} \times \frac{1}{2}$ -in. pieces of brass plate. Steering arms, drag link and tie rod are all formed from .050 brass wire and soldered in their respective positions. The completed front-axle assembly is wired and soldered to the center of each front spring, the brass wire representing shackle bolts. The four aluminum brake drums may be turned from $\frac{1}{8}$ -in. flat stock or from $\frac{7}{8}$ -in.-dia. bar stock. Four tiny grooves are turned in the edges of the drums to represent cooling fins, and a $\frac{1}{8}$ -in. hole is bored centrally through each drum to slip over the threaded ends of the axles.

The radiator body is cut, filed and polished to the shape indicated in Fig. 7 from a block of soft brass, $\frac{5}{8} \times 1\frac{1}{16} \times 1\frac{3}{8}$ in. Various holes indicated are drilled in the block, one in the top for the radiator cap,



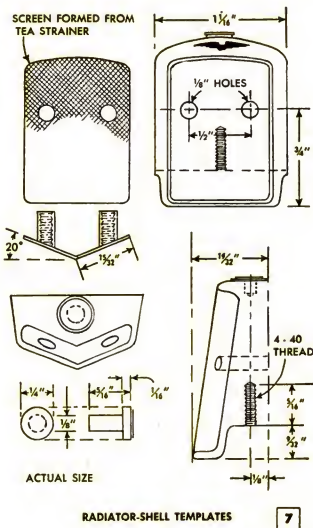
a tapped hole up from the bottom for bolting the radiator to the chassis and two holes through the body for fastening the screen plate to the face of the radiator. The screen plate is cut from .015 sheet brass, $\frac{7}{8} \times 1\frac{1}{16}$ in., and is bent down the center at a 20-deg. angle. Two short lengths of brass tubing, $\frac{1}{8}$ in. in dia. and $\frac{3}{16}$ in. long, tapped internally with a 4-40 thread, are soldered to the rear side of the screen plate to register with the two holes in the radiator. Two 4-40 x $\frac{1}{4}$ -in. brass screws are turned into the brass tubes to anchor the screen plate to the radiator. Finally, a section of tea-strainer screening, shaped the same size as the screen plate, is spot-soldered to the face of the latter. The completed radiator is nickel plated.

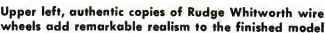
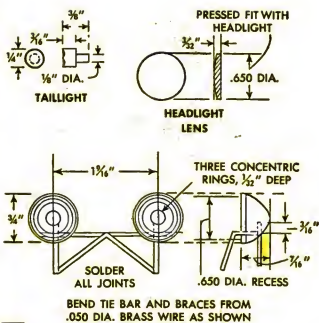
Fig. 8 details making of the headlights and taillight. The headlights are turned from $\frac{3}{4}$ -in.-dia. brass bar and recessed to take press-fit plastic lenses. The supporting framework for the headlights consists of short lengths of .050 brass wire, inserted in holes in the headlights and soldered to the splash pan.

The body of the car is built-up from five separate blocks; a right and a left-hand side, the hood, the cowl and the gas tank. All are glued into one unit after being shaped. The right and left-hand pieces, or sides of the body, are cut from blocks $1\frac{3}{16}$ in. thick, $\frac{3}{4}$ in. wide and $6\frac{1}{2}$ in. long. The final glue joint of the two blocks form the centerline of the body. Full-size paper patterns of the top and profile views, Fig. 1, should be made for tracing on your wood. Actually, only a half pattern of the body need be made as it is a duplicate on each side. The cockpit of the car is formed by sawing away a portion of both blocks at the center, following the dotted lines extending under the hood. The rear of the cockpit, as well as the sides, flares outward. This can be duplicated with a coarse file.



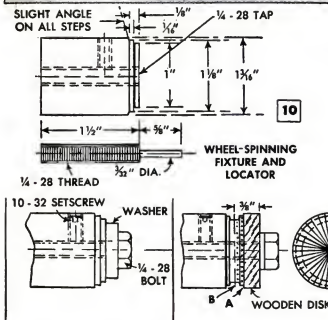
The hood is shaped from a block $\frac{1}{2}$ in. thick, 2 in. wide and $2\frac{7}{8}$ in. long. The cowl adjoining the top of the hood is shaped from a separate block. You'll notice a distinct tumble home in the lines of the cowl which is a feature of sports cars of this type. After the hood is glued in place, the top and sides of it are covered with four pieces





of .015 sheet brass in which louvers are first stamped from the underside. The sides of the hood require pieces $\frac{3}{4} \times 2\frac{1}{4}$ in., while the top of the hood takes two $\frac{1}{2} \times 2\frac{1}{4}$ -in. pieces. When the brass covering is cemented in place, the edges of the metal are carefully feathered out with a file to blend it into the rest of the body. Outlines of the doors are merely scribed in the body by drawing around a cardboard template with a pointed tool. The gas tank is cut from a $1\frac{1}{4} \times 1\frac{1}{2} \times 2\frac{1}{4}$ -in. block of wood. Before this is glued to the body, wells are cut $\frac{1}{4}$ in. deep in the sides of the body to provide clearance for the rear wheels. The windshield and the bucket seats are detailed in Figs. 6 and 11 respectively.

Fig. 2 gives the profile and plan patterns for the running boards and fenders which should be enlarged full size for tracing on your wood. The running board is a part of the sweeping front fender, both being shaped from two glued-up members, the inner one, or shield as it is called, being $\frac{3}{4}$ in. thick. The running board butts against the rear fender which is made separately and glued to the body. Ribbing on the running boards is simulated with strips of

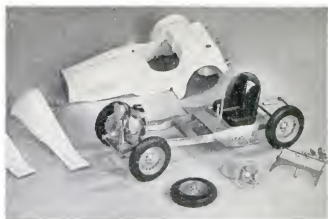


The wire wheels are spun and laced on a turned fixture that is chucked in the lathe. Rim flanges are spun from disks of aluminum, then two half rims are soldered together, edge to edge, to make one complete rim. Locator rod inserted in center of fixture to hold hub, makes lacing of spokes in rim comparatively simple.

cardboard glued in place. The original model was finished with seven coats of white lacquer, each carefully sanded.

The wire wheels, detailed in Figs. 9 and 10, are spun and laced on a special fixture which is turned from brass following the dimensions given in Fig. 10. The rim of each wheel consists of two half rims which are spun to conform to the stepped form of the fixture and then soldered together, edge to edge. Thus, the five wheels require 10 disks of .015 brass, 1½ in. in dia. Each blank disk is first annealed, then locked on the spinning fixture and spun to shape with the edge of a hardwood stick. The spun part of the rim is cut off from the rest of the blank at the very edge of the first step of the form. After a pair of half rims are soldered together, the complete rim is replaced on the spinning fixture and a back-up turning of hardwood, stepped to match the inner shape of the rim, is pressed into the outer half of the rim and held with the locking bolt. Next, rim A is indexed for 36 holes spaced 10 deg. apart and a scriber, or other sharp-pointed tool, is used to punch a tiny hole at each point. Then 36 more holes are laid out around rim B, staggering them between the holes in rim A and punching through into the back-up block as before. The punching produces a realistic spoke nipple on the inside of the rim. When all the holes are made as explained, gently work loose the back-up block from the rim.

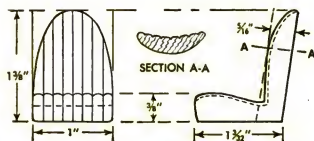
Next, five wheel hubs are turned from ⅜-in.-dia. brass rod, following the details in Fig. 9. Each tube is sweat-soldered to a ⅜-in. brass tube, ¾ in. long, which is later tapped internally with a 4-40 thread after the wheel is laced and the excess tube cut off. The locking bolt is now removed from the spinning fixture and replaced with a locator rod, Fig. 10, on which the hub is placed. The wheel rim is temporarily spot-soldered to the fixture at three or four points to hold it in place for the lacing operation. The solder will be turned off later. Using .011 brass wire, start lacing by tying a knot in the end of the wire and pull it taut through a hole in rim A. Next, loop the wire around the end of the locator and press the looped wire into the recess in the hub. Bring the wire up through the next hole in the rim, pull taut and anchor with a drop of solder applied to the top of the rim. Continue lacing in this same manner all around the rim, then flow solder over the wire in the hub recess. To lace the inner row of holes, B, the rim is cut free, reversed on the fixture and resoldered. This requires first counterboring the end of the fixture to clear the laced hub. Lacing the inner row of holes is done the same as before, and after soldering the wires at the



hub, a ⅜-in. brass disk is sweat-soldered over the face of the hub to finish it off. Finally, the excess tubing is cut off and the wheel is ready to be nickel plated.

Tires are turned from rubber desk-leg cushions sold at hardware stores. To make a tire, screw a rubber block to a wooden block attached to the lathe faceplate and turn the outside diameter of the tire, including the treads, with a sharp chisel. Then remove the work and turn a recess in the wooden faceplate block so the rubber turning can be wedged snugly in the recess for boring the inside diameter. This should be of a size to provide a light push fit over the rim. Each side of the tire is shaped by reversing it in the recess. Use sandpaper to finish the rubber smoothly and paint the finished tire black. As the wheels are designed to thread onto the threaded axles, they thus remain fixed and are kept from backing off with racing-style hub caps, Fig. 9. These are shaped from .031 sheet brass, ⅜ in. wide and ⅞ in. long. A 4-40 x ¼-in. flat-headed, brass machine screw is sweat-soldered to the back of each hub cap. Like the wheels, the hub caps also are nickel plated. ★ ★ ★

BUCKET SEATS MADE FROM TWO BLOCKS OF PINE GLUED TOGETHER. MARK OFF PLEATS AND CARVE ACCORDING TO SECTION A-A



11



HERE ARE A FEW tricks to help you make neater, more professional-looking cabinet doors from tongue-and-groove lumber. Such doors are especially attractive in paneled rooms, where it is desirable to have cabinet doors that match the rest of the wall. The doors shown in the photographs were made of wormy chestnut.

One trick, to eliminate the heavy Z-framing so often used for such doors, is to use two lengths of angle steel across the ends of the boards to hold them together. The ends of the boards are rabbeted to receive the angle, and the angle is fastened to the boards with roundheaded screws driven through slots. The slots are cut to allow the wood to expand during damp weather without warping. An alternate method would

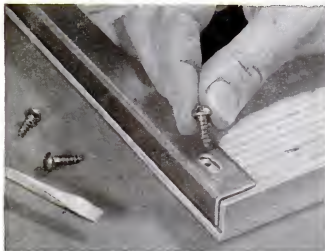
be to assemble the boards with a spacing between them at the joints.

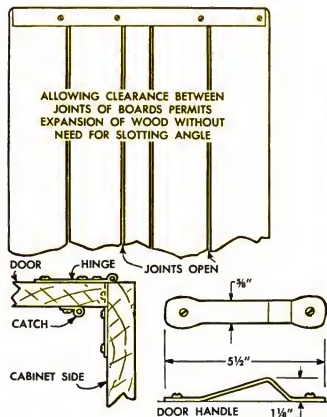
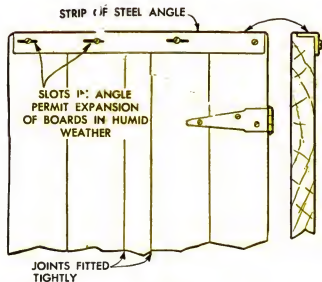
Another method of achieving a professional look is to have the door fitted with handmade hardware. This is done by converting inexpensive iron strap hinges into handmade ones by hammering all the visible surfaces with a ball-peen hammer. Hammer some distortion into the edges to kill that machine-made look. As peening will warp the hinge leaf, turn it over several times and hit it to straighten it.

If the doors are hung in dry weather, a $\frac{1}{4}$ -in. allowance should be left between them for expansion. During warm moist weather the doors can be installed with a tight fit. Shrinkage and expansion are mostly in a cross-grain direction.

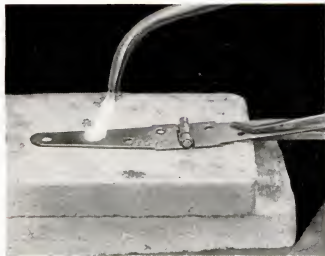
A length of angle steel is fitted into the rabbeted door and fastened with roundheaded screws through slots

"Antiqued" hinges can be made by hammering regular strap hinges to eliminate the machine-made look





Below, when a hinge has been textured with a hammer, give it a heat-coloring treatment. Polish the surface with steel wool, then heat slowly until color changes. Remove heat when desired color appears



Above, the textured leaf of the hinge is mounted in the conventional way on the front surface, and the edge of the wood is notched so that when the other leaf is swung back at right angles it will be flush



Above, handles to match the hinges can be bent from iron strips and textured to match hinges. Below, the screws should also be textured to match. They should be hammered and colored as the hinges were



Leaf From Broken Auto Spring Used to Remove Shingles



The job of removing shingles from a house, preparatory to reshingling, can be made easier by using a tool made from one leaf of a broken automobile spring. To serve as a handle, one end of the leaf is taped, while the other end is beveled to allow it to slide under the shingles easily. The tool is long enough to give good leverage, and the natural spring action of the leaf permits the shingles to be pried off with a minimum of effort.

R. M. Woodbury, Natick, Mass.

Screw Eye Driven Into Slot Locks Handle in Brush



If the handle of a floor brush becomes loose and pulls out of the brush, the trouble can be overcome by driving a screw eye into a slot cut in the end of the handle. The slot is sawed 2 or 3 in. deep and the handle is pushed back

into the hole in the brush. A screw eye then is driven into the slot where it acts as a wedge to spread the end of the handle and lock it tightly in the hole.

Tip for Squirrel Hunting

If you have ever hunted squirrel alone, you know that once a squirrel is aware of your presence he keeps moving to the opposite side of the tree, preventing you from taking a shot. One hunter, to make the squirrel come to his side of the tree, carries a 100-ft. length of cord with him which he

ties to a bush 30 or 40 ft. from the tree in which the squirrel is sitting. He then walks to the opposite side of the tree and makes a noise by pulling the cord and shaking the bush. Disturbed by the sound, the squirrel goes to the other side of the tree, giving the hunter a clear shot.

M. C. Hosmer, McCalla, Ala.

Adjustable Low-Level Tripod Improvised From Ash Tray

An adjustable low-level tripod, which is sometimes necessary for extreme-angle and other process shots, may be improvised from a metal ash tray, of the type shown in the illustration. Drill a hole in the center of the inverted ash tray and fit it with a 1/4-in. bolt, held in place with a nut and lockwasher. The small tilting top from a standard tripod will fit over the projecting bolt and can be locked with the thumbscrew.



Stamp-Pad Cover Shielded Against Corrosion

The hinges of a stamp-pad cover usually will corrode because of chemicals in the ink, making the cover difficult to open. But if a narrow strip of sheet metal is forced between the pad and the hinge, as shown, the ink will be confined to the pad. The hinges then can be lightly oiled, and will open easily throughout the lifetime of the pad. Thin sheet aluminum would be best for this purpose, since it is nonrusting, but other metals could also be used.



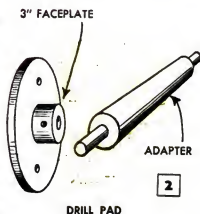
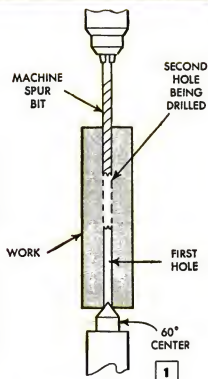


SHOP NOTES

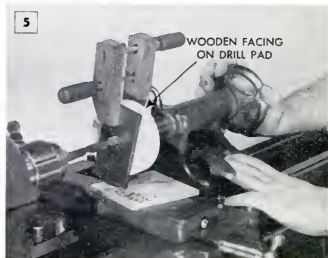
DRILLING IN THE LATHE

By Sam Brown

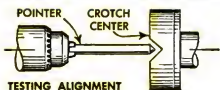
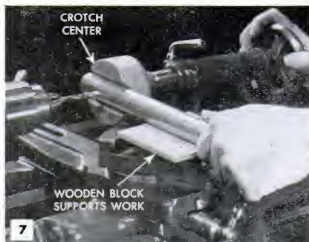
DRILLING IN THE metal or wood-turning lathe can be done with the drill rotating and the work held stationary, or with the drill held stationary and the work rotating. Machinists refer to the rotating drill bit as "live" and the stationary drill bit as "dead." In live drilling the bit is held in a chuck and driven by the headstock spindle. Large drill bits with tapered shanks are inserted in the tapered spindle and driven direct by the spindle itself without any support other than a dog applied as a precaution to prevent the drill shank from scoring the spindle sleeve should it suddenly "freeze" in the nonrotating work. Live drilling is applicable to a wide range of work because of the variation in speeds available at the metal-lathe headstock. However, drilling from the tailstock has a wide application because of the delicate feed and positive control possible by tailstock feeding.



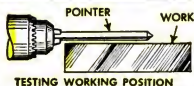
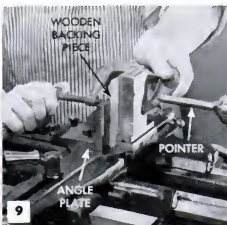
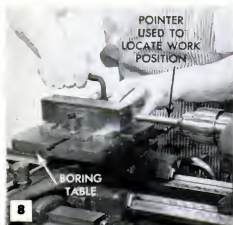
In live drilling, pictured in the photos above and below, the drill usually is held in a geared chuck and driven by the lathe headstock. Flat work is supported by a pad as in the lower views. Note wooden facing



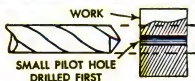
Live Drill Is Driven by the Lathe Spindle



A V-BLOCK OR A CROTCH CENTER must be used when cross-drilling round work in metal or wood-turning lathe. A hardwood V-block is easily made for drilling operations on wood as in left-hand view above. A round V-block or a crotch center of hardwood is suitable for certain drilling operations on metal. Work must be correctly aligned



POWER FEED can be used when work is mounted on lathe carriage, using either the boring table, angle plate or milling attachment. Boring table can serve for indexing circular work. A pointer must be used to align the work before drilling. When centers have been located, pointer is replaced by drill bit, as in right-hand view

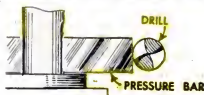
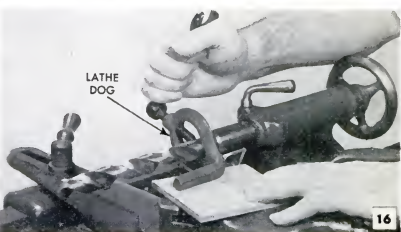


LARGE DRILL BITS should be driven by a lathe dog. This will prevent any possibility of the drill turning in the spindle sleeve and scoring it. When using large-diameter drills it is always best to drill a pilot hole first, as in the detail at the left. This will aid in starting larger drill bit, result in cleaner hole and prevent breakage

Dead Drill Is Stationary, Work Rotates



DRILL MOUNTED IN TAILSTOCK gives hand control of the rate of feed which is important on certain types of very fine work, using small drill bits. When work tends to pull sidewise apply side pressure with end of tool-holder or supporting fork made as in detail at the left. Apply a lubricant to prevent scoring the work. Be sure drill bit is correctly ground

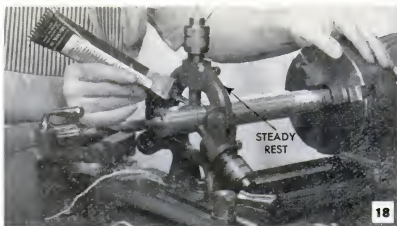
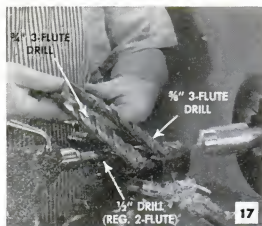


SIDE PRESSURE applied to the drill bit often is necessary in order to start it correctly. However, pressure should be very light, just enough to steady the drill until it is cutting the full diameter. Large drill bits with tapered shanks should be supported with a lathe dog. This will prevent the drill turning in the tailstock sleeve and possibly scoring the sleeve or the spindle

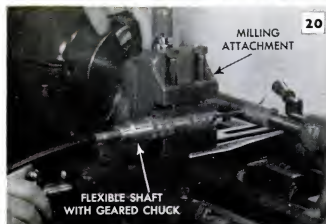
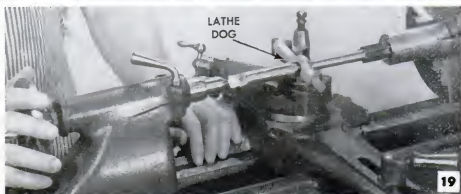
Chucking: Figs. 1 to 12 inclusive picture live-drilling setups which are typical of those commonly used in both wood and metal lathes. Figs. 1, 3, 4 and 5 show setups for drilling work longitudinally and also drilling from one face against a pad, Figs. 4 and 5. Note that in all instances, Figs. 1 to 10, the drill bit is held in a screw-on chuck driven by the lathe spindle. In Figs. 8 and 9, the work is located by using a pointer. After work is located, the pointer is replaced by the drill bit as in Fig. 10. In Figs. 11 and 12 the drill bit is of the type having a tapered shank. It is inserted in the tapered spindle sleeve and driven by a dog as shown. Another example of how work may be fed by the tailstock against a live drill is shown in Fig. 3. Here work to be mounted between centers in the lathe

is center-drilled by using the combination drill and countersink shown in the insert. The operation is similar to that in Fig. 1, except that in the latter case the work is drilled through from both ends, the drill being run in to the halfway point and the work reversed and supported at the tailstock end on a 60-deg. center. If you have no drill pad and the amount of work does not warrant the purchase of this accessory, you can easily improvise a suitable pad as in Fig. 2.

Work support: When the drill is driven by the headstock, either the tailstock or the lathe carriage becomes the logical work support. Both provide a means of advancing the work to the drill. If the drilled hole is small it generally is quite safe to hold the work by hand, Fig. 4, but it usually



HOLE REQUIRED



Three-flute drill bits, Fig. 17 are smooth cutting, suitable for enlarging holes. Steady rest, Fig. 18, is not necessary for drilling but is included in setup when machining is to be done. In straight reaming, Fig. 19, reamer is carried on a 60-deg. center

bits with tapered shanks, Fig. 17, are inserted in the tailstock sleeve, or quill, as in Figs. 16, 17 and 18. The lathe steady rest, Fig. 18, normally is not needed for the drilling operation, but is always included in the setup if drilling is to be followed by any turning operation on long stock held in a three-jaw chuck. Large drill bits are supported by a lathe dog as in Fig. 16. The tail of the dog bears on a block of thin wood to prevent it from marring the surface of the compound. In some instances when drilling from the tailstock the drill or the work may tend to draw off-center as the drill engages it. This can be corrected by applying side pressure as in Figs. 14 and 15.

Reaming: A typical setup for reaming a drilled hole is shown in Fig. 19, using a straight reamer carried on a 60-deg. center in the tailstock. Note the use of a lathe dog to prevent the reamer from turning. In holes up to 1 in. in dia. the reamer should never remove more than .006 if smooth work is to be produced. Use a lubricant.

Cross drilling: Very accurate cross, or transverse, drilling is possible with the setup pictured in Fig. 20, using small drill bits. The hand piece of the flexible shaft is clamped in the vise of the milling attachment and centered vertically on the work. Then the drill is fed into the work with the lathe-carriage cross-feed. ★ ★ ★

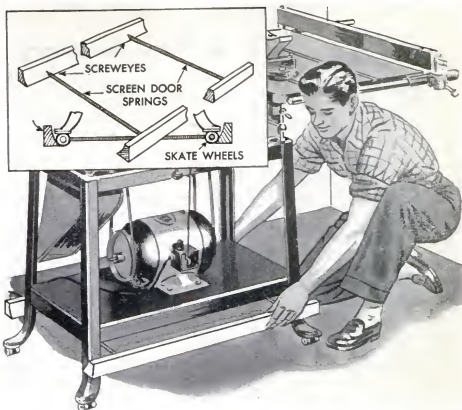
Accurate cross drilling can be done with flexible shaft held in milling attachment. Locate centers accurately

is best to clamp it in position with a wooden facing on the drill pad as in Fig. 5. Still another method is to provide a stop or support as in Figs. 6 and 7. In Fig. 6 wood is being drilled and in Fig. 7 a steel shaft is being drilled transversely, supported in a crotch center of hardwood. Various setups also can be made on the lathe carriage, using a boring table, an angle plate or a milling attachment for holding the work as in Figs. 8, 9 and 10. Avoid overloading in these setups as breakage may result. A small lathe and accessories will handle drill bits up to $\frac{3}{4}$ in. in mild steel and cast iron. Speeds for the larger drill bits should not exceed 350 r.p.m. with 250 r.p.m. a good average speed.

Drilling from tailstock: In dead drilling, the drill bit generally is held in a geared chuck as in Figs. 13, 14 and 15. This method is suitable for drill bits up to $\frac{1}{2}$ in. Larger

Spring Tension Holds Chocks Against Casters on Power Tool

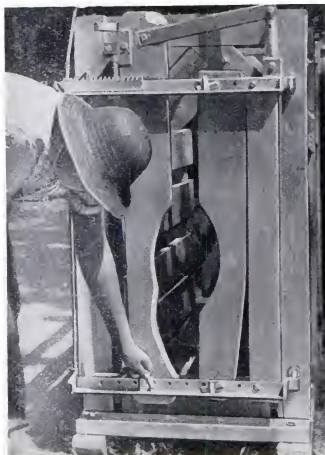
One shop owner who utilized roller-skate wheels as heavy-duty casters on one of his power tools, installed two wooden chocks under spring tension to lock the wheels. The chocks are lengths of 2 x 2 or 2 x 4, beveled on the inside edge. Screw eyes are screwed into the lower inside edge and screen-door springs are hooked into the eyes and used to hold the chocks together and against the wheels. When the wheels are released, the chocks are slipped out of the way and held against the legs by the springs. A pair of roller-skate wheels on half a skate frame is used under each leg of the machine.



Portable Hog-Ringing Crate Has Adjustable Stanchion

Merely moving a few steel pins to different holes allows the stanchion opening on this portable hog-ringing crate to be adjusted to fit any size animal. The crate, which measures 20 x 40 x 60 in. inside, has a gate at the front and back. The front

gate, which is the stanchion, is fitted with steel angles welded to the hinges to prevent it from being lifted. Each of the steel pins, which fit into conveniently spaced holes for the various adjustments, has a small crossbar welded to one end. When the pins are in place, they are turned so the cross-bars fit behind short lugs welded to the steel angles.



Extension Perch Removes Fowl From Trees on Open Range

Fowl running on open range often get into the habit of roosting in trees rather than returning to the poultry house at night. To discourage this habit, which exposes the birds to night-prowling predators, one farmer removes the birds by using a perch nailed to the end of a long stick. The perch is pushed against the roosting bird's breast, which makes it automatically step forward onto the perch so it can be lowered and transferred to the protection and safety of the poultry house.



G. E. Hendrickson, Argyle, Wis.

SN 56

NEW USES for PORTABLE SAW

YOUR PORTABLE electric saw is designed to cut almost anything—wood, metal, stone, concrete, glass fiber, hardboard, softboard and composition materials of various kinds. The table on the opposite page gives complete cutting instructions and tells you the kind of blades and abrasive disks to use for different materials. The photos picture typical operations on wood, concrete, tile and metal. The saw requires no alteration other than changing the blade or disk to one suitable for use on the material to be cut. No special techniques are required. Most operations are one-handed, the same as in cutting wood. When saw is used on a vertical surface, or overhead, use both hands to hold it properly. Also when making exceptionally deep cuts, or when cutting metals, the saw should be held in both hands as in the right-hand photos on the opposite page. Operator should wear goggles when cutting with abrasives. ★ ★ ★

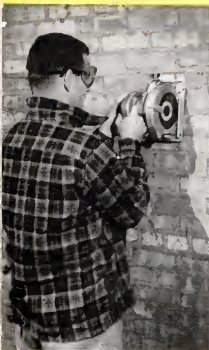


Above, note similarity of operations of cutting wood and clay tile. Saw is held in same manner. Woodcutting blade is replaced by abrasive disk for cutting tile. Right and below, saw squares up broken pieces of hollow tile and concrete for re-use



Right, saw cutting a length of steel shafting, using an aluminum-oxide abrasive disk in place of a toothed blade. Lower right, cutting a stone lintel with abrasive disk. Wear goggles on abrasive-cutting operations

Lower left, opening old mortar joints preparatory to repointing is job for portable saw with abrasive disk. Disk is set to take shallow cut to avoid damaging bricks when cleaning vertical joints. Center, cutting cast-iron soil pipe with a portable saw



Photos and technical information courtesy Skil Corp.

CUTTING INSTRUCTIONS FOR VARIOUS MATERIALS

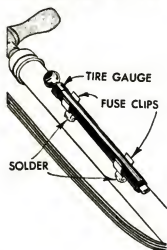
Type of Cut	Type of Blade	WOOD	Comments
Ripping or rough cutting	Rip or combination	Keep blades sharp. On resinous or wet woods put extra set in teeth.	
Crosscut	Combination or crosscut	Crosscut blade for smooth cut on hardwood. Combination blade for rough cut.	
Finishing or mitering	Miter or fine tooth	Miter blade for trim. Fine-tooth for veneer. Feed slowly.	
Plywood	Fine tooth, miter, cross-cut or carbide tipped	Fine-tooth blade for 1/4-in. or thinner panels; miter blade for thicker sheets. Carbide-tipped blade on exterior plywood.	
FERROUS MATERIALS			
Cast iron, cast soil pipe	Flexible or cutoff wheel	Flexible wheel for continuous cutting; cutoff wheel for occasional work.	
Sheet steel	Friction or flexible wheel	Friction blade up to 16 ga.; flexible wheel for heavier gauges.	
Stainless steel	Friction or flexible wheel	Friction blade up to 16 ga.; flexible wheel for heavier gauges.	
Aluminum	Metal-slitting, miter or cutoff blade	Metal slitting for light gauge. Miter or cutoff blade for infrequent cutting. Use lubricant.	
Brass, copper	Metal-slitting or flexible cutoff wheel	Flexible wheel for hard alloys or thick sections. Slow speed for copper 1/2 in. or thicker. Use lubricant to cool blade.	
Lead	Floor blade	Use lubricant. Large saw and undersized blade minimize load.	
ASBESTOS AND GYPSUM PRODUCTS			
Combination materials	Carbide-tipped, diamond-grit or flexible cutoff wheel	Carbide tipped for production; diamond grit for extremely hard materials; flexible wheel for occasional work. Water attachment must be used with diamond grit.	
Plasterboard, gypsum plank	Carbide-tipped, cutoff or flexible wheel	Carbide tipped for production; cutoff or flexible wheel on metal-bound or wire-reinforced board only.	
MASONRY, TILE, CONCRETE			
Marble, slate, stone	Flexible, cutoff or diamond grit	Diamond grit for hard materials (hard tile or firebrick). Feed slowly. Support brittle stone (slate) at cut. Use water-feed attachment with diamond grit.	
Tile, brick	Flexible, cutoff or diamond grit	Diamond grit for hard materials (hard tile or firebrick). Feed slowly. Support brittle stone (slate) at cut. Use water-feed attachment with diamond grit.	
Concrete	Flexible, cutoff or diamond grit	Diamond grit on hard concrete; flexible wheel for reinforced concrete. Water attachment with diamond grit.	
SPECIAL COMPOSITIONS, LAMINATIONS, WALLBOARDS			
Metal and wood laminations	Metal-slitting blade	Metal-slitting blade for steel-laminated wood; also for zinc or aluminum laminated. Cut with face side down.	
Wallboard	Fine-tooth blade	Carbide tipped for asphalt-coated board. Support well during cut. Cut with face side down.	
Aggregate coated board	Carbide-tipped blade	Wipe blade occasionally with kerosene to remove asphalt build-up. Cut with face side down.	
Fiberglass, laminates	Flexible or cutoff wheel	Use water-feed attachment to keep dust down. Lower foot for smoother cut.	

Suction Cups Provide Vanishing Points for Perspective Drawing



Large rubber suction cups of the type fitted with a screw can be used to provide the vanishing points of a perspective drawing when the points must be located outside the board. Place the board on a large table or desk and locate the cups at the desired positions on the table. Hold a yardstick or other straightedge against the screw and strike off the perspective lines. An alternate method is to use a yardstick fitted with a screw eye, as shown in the detail. The screw eye is driven into the end of the yardstick so the edge of the stick aligns with the screw. The screw eye should be a snug fit on the screw.

Fuse Clips Hold Air Gauge On Barrel of Tire Pump



One way of insuring that the air gauge is always kept with the tire pump is to fasten it to the barrel of the pump with two fuse clips. Two cartridge-fuse clips of about 40-amp. size, properly spaced, are soldered to the barrel of the pump. —Albert P. Zanelli, Tampa, Fla.

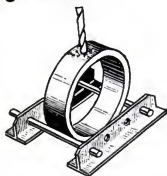
Piston Welded in Cylinder Aids Removing Sleeve

When he had difficulty removing the worn sleeves from a tractor engine, one farmer inverted a discarded piston in the cylinder and welded it solidly to the sleeve with a bead around the skirt. A length of

lumber then was inserted from the bottom of the cylinder, held against the piston and used to drive out the welded sleeve-and-piston assembly. —W. J. S. McLaughlin, Christchurch, New Zealand.

"V-Block" for Large Work

Large-diameter work can easily be accommodated in an adjustable "V-block," consisting of two lengths of steel T-bar and two lengths of steel round stock. A number of equally spaced holes are drilled in the vertical web of both T-bars to allow the steel rounds to be used as cross members of the V-block. The various holes in the T-members permit adjustment in width, while the use of longer or shorter lengths of round stock permits lengthwise adjustment. —C. W. Woodson, Chicago.



Poultry-Yard Water Supply Furnished by Steel Drum

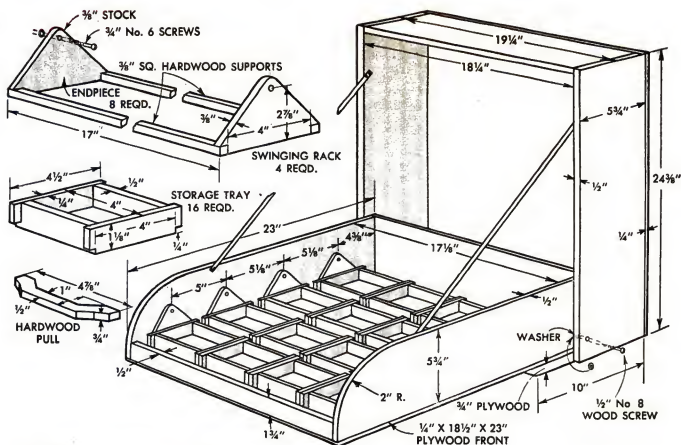
Fitted with a float-type watering cup, as shown in the photograph, a 55-gal. steel drum will provide a generous supply of water for the poultry yard. Because the float regulates the supply, there is seldom any overflow of water to cause a mudhole and the steel drum will not dry out in the sun, as will a wooden barrel. The drum head is not cut out, thus the drum is sealed so the birds cannot get into the water to dirty it. A hose is used to fill the drum through one of the threaded bungs.

A. M. Wettach, Mt. Pleasant, Iowa.



When assembling handles and ferrules on tools, coat the parts with lacquer. When wet, the lacquer provides lubrication for assembly and, when dry, has the same holding power as a waterproof cement.

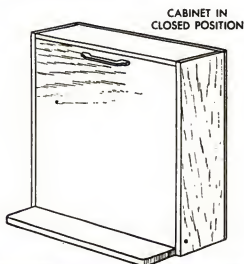
SN 56



Drop-Front Cabinet FOR PARTS STORAGE

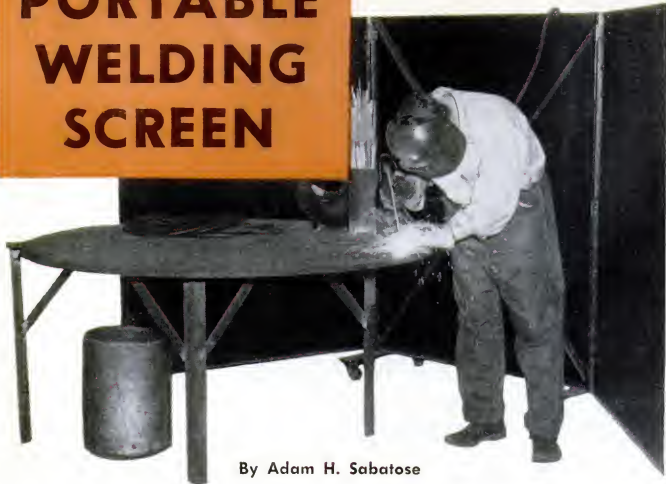
By Dick Hutchinson

SWINGING STORAGE RACKS in this drop-front cabinet are always level and the individual trays, four to each rack, are purposely made shallow so that assorted small parts in the trays are readily accessible. Individual trays can be lifted out for closer inspection of the contents. Trays and supporting racks are made from hardwood, such as oak or maple. The trays are fitted with 1/16 or 1/8-in.-plywood bottoms. The cabinet is a simple box with a plywood back. The corners are butt joined with screws and glue. The lower endpiece, or bottom, of the cabinet is 10 in. wide and extends to form a shelf when the drop front is closed, as in the center view at the right. Four trays are made to the dimensions given in the upper left-hand detail and pivoted in the drop front. The racks should be 1 in. from the plywood front piece so that they will clear when the front is closed and they swing to the level position. Add chains or tapes to support the drop front when lowered as in the photo.



SN 56

PORTABLE WELDING SCREEN

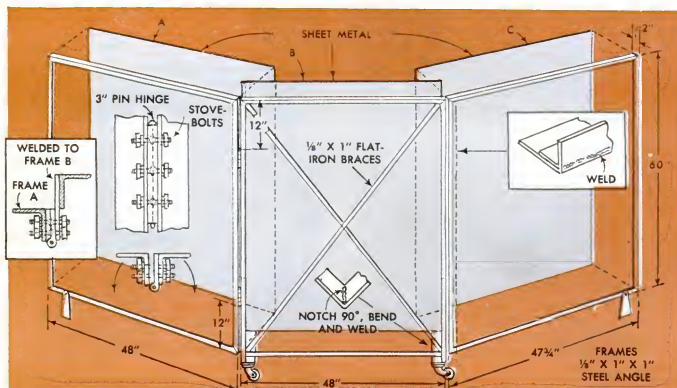


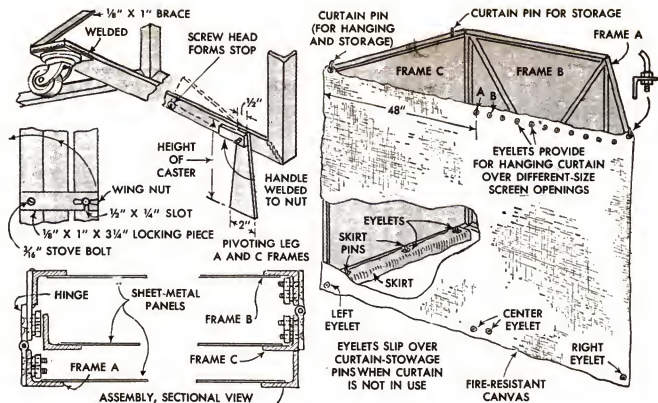
By Adam H. Sabatose

WELDERS WORKING IN small shops where space is limited, or on assembly floors where others near by need protection, usually improvise a screen which confines torch and arc glare and also restricts any possible fire hazard to the im-

mediate area in which the work is being carried out.

Rather than improvise for each special job one welder designed and built this portable screen. It is made by welding heavy sheet-steel panels into angle-





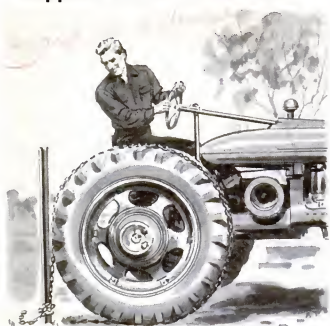
frames, two of which are hinged to fold flat for transport from one point to another. When folded, the unit rolls easily on heavy casters. The dimensions given are those of the original screen and can be changed within reasonable limits to suit any special purpose. The detail on the opposite page shows the position of the parts and the methods of assembling the frames. All joining parts are welded. When opened, the wings are supported on short folding legs as detailed above and on the opposite page. Before cutting parts, note in the sectional assembly view above how the panels A, B and C are hinged.

frames, shown in the photo below, are on one side only.

When welders must work screened on all sides a fire-resistant canvas curtain and skirt can be attached permanently to the screen as in the right-hand detail above. Curtain pins, for hanging and storage, are made from steel rod, cut into short lengths and threaded and bent as indicated. Rows of eyelets in the curtain provide a means of hanging it over screen openings of varying size. Note that the handle is designed to slide back under the frame when not in use. The free end is supported by an eye made from 1/4-in. steel rod. ★ ★ ★



Posts Easily Pulled by Chain Wrapped Around Tractor Tire



A quick and easy method of pulling steel fence posts is to use a length of chain wrapped around the rear tire of a tractor. The chain is stretched out on the ground, leading away from the post, and the tractor wheel is backed over it. The forward end of the chain then is passed up and around the tire and tied to the post, close to the ground. The chain will lift the post as the tractor is driven forward.

Edwin W. Saeger, Rock Rapids, Iowa.

Spring Clamp Wired to Cord Prevents Pulling Plug



The problem of overreaching the length of a drill or extension cord and pulling the plug out of the receptacle can be overcome by using a spring clamp of the type shown. The clamp is taped or wired to the cord at a point several inches from the plug and is snapped onto a wood screw driven into the wall adjacent to the receptacle. When the limit of the cord is reached, the clamp and screw absorb the pull, rather than the plug.

Marion L. Rhodes, Knightstown, Ind.

Adjusting Car Horn Noiselessly

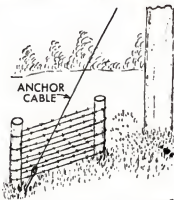
To make adjustments on the horn ring or steering column of a car without sounding the horn, which may be annoying to persons near by, connect a 6-volt bulb into one of the horn wires in series. The bulb

will light up when current is passing through the horn but will not pass enough current to sound the horn. Thus, the horn circuit can be tested silently.

Walter H. Smarook, Somerville, N. J.

Barbed Wire Wrapped on Posts Keeps Cattle Away From Cable

Cattle scratching themselves on the anchor cable of a transformer pole, which carried high-voltage lines, caused the wires to sway so violently that there was danger of the uninsulated wires being broken and falling to the ground. Two fence posts, wrapped with barbed wire as shown, eliminated the hazard. The posts were set in line with the cable and the pole, one on each side of the cable. The barbed wire then was wrapped between the posts at a height above the shoulders of the animals, to effectively discourage them from approaching the cable.—Henry Josephs, Gardenville, Pa.



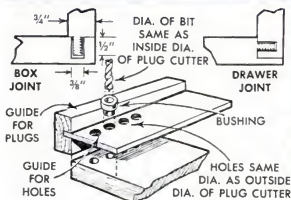
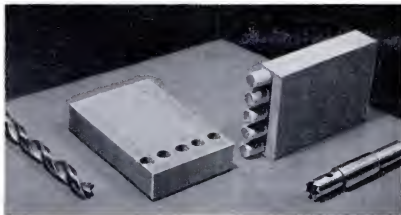
Altered Tractor-Gearshift Lever More Easily Reached

Easier tractor operation was the result of bending and lengthening the gearshift lever. It formerly was a short, straight lever under the steering wheel that was awkward to reach. Another factory-built lever was purchased, the top cut off and the lever bent as shown. Then the old lever was cut off and welded to it.

A. M. Wettach, Mt. Pleasant, Iowa.



Round-Pin "Dovetails" Made With Plug Cutter



Using a plug cutter and a bit to drill matching holes, you can make corner joints which are the equal of the dovetail joint in strength. The plug cutter forms round projections in an offset position on the end of one of the joining members. Spaced holes are then drilled across one face of the second member as in the photos. To insure an accurate fit the holes must be drilled with a jig which utilizes a shouldered bushing as a guide for the bit. No dimensions are given as the jig must be made up to suit

the work at hand. Any number of holes and pins may be used, but they must be carefully spaced so that the holes do not cut out at either edge of the stock. The set-up for drilling the holes accurately is pictured in the photo and also shown in the detail. Note the variation in the box and drawer joints. If the holes for the drawer joint are drilled clear through and the pins made correspondingly longer, the joint that results is similar to the "round pin" drawer joint used by early cabinetmakers.

Blower Fan on Router Bit Keeps Work Cleared

To keep the work free of chips when routing with a drill press, slip a blower fan over the router bit. The fan is a 2-in.-dia. disk of cardboard, slit at several points around the edge to form a number of vanes which are twisted slightly to provide a pitch.—H. Hanscom, Elmhurst, Ill.



Spring Clamps Used in Shop To Hold Small Gluing Jobs

Ordinary stationer's spring clamps can be used to hold many small gluing jobs around the shop, in modelmaking and wherever pressure is needed while the glue dries. They come in a variety of sizes, are inexpensive and the pressure exerted by the bowed steel in the closed end of the clamp is considerable.

Art Frank Williams. Wood-Ridge, N. J.



1

SHOPPING FOR TOOLS

1. DRILL EXTENSION designed for use with portable electric drills consists of a flexible coupling, an extension shaft and a handle. The flexible coupling takes a standard $\frac{1}{4}$ -in.-drill chuck. The handle, made from very hard wood, provides a means of guiding the drill and at the same time serves as a bearing back of the drill chuck on the extension as pictured

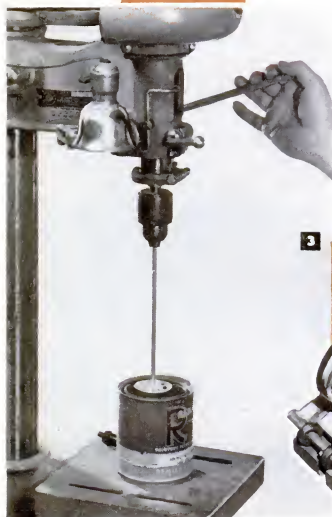
Itumar Corporation, 183 New York Ave., Huntington, N. Y.



2

2. PORTABLE BANDSAW for cutting metal weighs only 16 lb., making it light enough to be used freehand in any ordinary work position. Cuts stock up to $3\frac{1}{4}$ x $4\frac{1}{4}$ -in. sectional size in ferrous and nonferrous metals and other problem materials. Speed of the saw band is 240 s.f.m. under full load. Bands are available in sizes ranging from 6 to 32 teeth per inch

Porter-Cable Machine Co., Syracuse 8, N. Y.

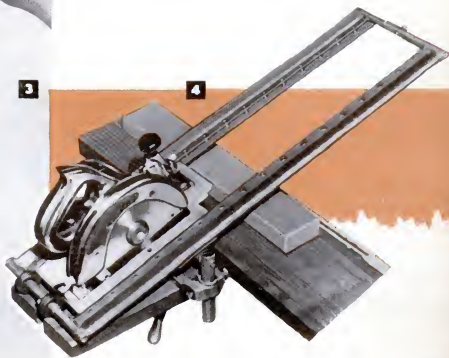


3. PAINT MIXER can be operated with any portable electric drill or driven by a drill press as pictured. Designed for mixing paint, enamels and lacquers in gallon, quart and pint cans, the mixer head does a thorough job without lifting the liquid over the rim of the container. Head is self-cleaning; does not accumulate paint pigments while in operation

Cohn and Co., 11 S. Marion St., Warren, Pa.

4. PORTABLE-SAW GUIDE tilts from the horizontal work position when saw is retracted, allowing ample clearance for placement of stock for mitering or cutting to length. Pivots for angle sawing and is fitted with a positive lock. Guide can be raised or lowered to accommodate stock of varying thickness and is adjustable to fit base plates of different-make saws

Radial See-Saw, 4140 Syracuse, Dearborn, Mich.



3

4

5. CENTER-PUNCH DUPLICATOR has been designed to eliminate the necessity of scribing a number of lines to locate holes or points on surface of work. Sliding stops are set to required measurements on scale arms. Unit is then placed in position with stops against sides. Striking spring-loaded center punch in guide gives accurate indentation at point desired

Hemlga Tool Co., P.O. Box 656, Terre Haute, Ind.



6. MINIATURE TORQUE WRENCH for assembling electronic devices, instruments and other delicate units has torque gauge registering in inch-grams and inch-ounces. Tool is available with scale marked in either calibration. A pull chain replaces the ordinary solid handle. The chain prevents inaccuracies and twisting which might damage tiny bolts or screws

P. A. Sturtevant Co., Addison, Ill.



7. T-HANDLED SCREW DRIVER has efficient non-ratchet drive, enabling operator to apply considerably more torque, or twist, when tightening screws under difficult conditions. T-handle is of aluminum, correctly shaped for easy handgrip. Jaw-type clutch gives positive engagement and drives in either direction. Handle is spring-loaded to release clutch automatically

J & L Tool Co., P.O. Box 82, Three Rivers, Mich.



8. HARDNESS TESTER is pocket size, operates on the rebound principle and combines low cost with accuracy. In use, ball-pointed rebounding bar is raised and released by means of a catch. Bar then falls and rebounds to point on scale corresponding to hardness of object. Accuracy readings to 1 point Rockwell C are consistent. Conversion tables are available

Kurt Orban Co., Inc., 205 E. 42nd St., New York City 17

9. METAL-CUTTING BANDSAW has 6-in. throat capacity and 9-in. clearance under the guide. Cuts at any angle up to 45 deg. Saw band runs on 10-in.-dia. wheels. Auxiliary table is provided so that machine can be used in vertical position for cutting metal or wood. Machine is adjustable right or left for positioning cut. Wheeled truck is regular equipment

Tester Mfg. Co., Iron River, Wis.



SHOPPING FOR TOOLS



10

10. CUSHIONED FILE HOLDERS are available in several sizes and types for holding special files and also abrasives for sanding and polishing on flat and curved surfaces. Spange-rubber facings permit abrasive to follow contours with equal pressure. The files are fitted with handles for two-handed operation

Milwaukee File Co., Milwaukee 4, Wis.



11

11. WELDER'S TURNTABLE permits precision placement of small parts and holding in either a vertical or horizontal position, or at any angle. Takes 100-lb. load. Turntable, or platen, is motor driven and is controlled by means of a foot switch. Built-in ground provides resistance-free return of welding current

Superior Welding Co., 3410 E. 14th St., Los Angeles 23



12

12. FUSE PULLER is double-ended with handles hinged to give the action of a taggle on both sets of jaws. Small jaws take cartridge fuses up to 30 amp. Large jaws handle fuses to 100-amp. size. Made from tough plastic to protect user from possible shock. Toggle grip prevents fuse from slipping out of the jaws

Star Fuse Co. Inc., 235 Canal Street, New York City 13

13. NAIL DRIVER eliminates possibility of injury when setting masonry nails. Nail is inserted in safety sleeve where head is held securely by magnet. Driver then is placed over mark where nail is to be driven, the outer sleeve pressed in and struck with hammer to start nail. Takes all common sizes of masonry nails

Safety Nail Driver Corp., 70 Roselle Ave., Clifton, N. J.

14. LEATHER-LACING CUTTER cuts lace to any desired width from leather of varying kinds and thicknesses. Sharp cutter slices clean, is adjustable to cut any width up to 3 in. from the guide. This makes it possible to use the tool for cutting straps and single-ply leather belts. Leather skiver also is available

Carvir Company, 322 31st St., Hermosa Beach, Calif.



13



14



Advanced Chevrolet Engineering brings
PROGRESS IN PLASTICS
 for greater beauty and durability in bodies

In the new Chevrolet, dozens of body and assembly parts are now made of durable plastic materials. You see it in the three-dimensional beauty of the hood, trunk and wheel emblems. You welcome it in the extra protection a plastic bond gives Chevrolet safety plate glass windshields. And you feel its soft-textured smoothness as soon as you slide into the all-plastic interior of a Convertible, Station Wagon or Delray Club Coupe (shown above).

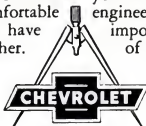
In these Chevrolet models you're completely surrounded by colorful, comfortable vinyl plastic. Good looking, sure; but that's only one advantage. Plastic, you know, not only lasts and lasts, but is easily cleaned if stained. Dirt usually wipes right off. The comfortable vinyl seats, practically friction free, have the smart appearance of genuine leather.

Another advantage: Soft, flexible plastics can be finished in all kinds of designs and colors. That's why these Chevrolet interiors are so inviting just to look at!

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Your Chevrolet dealer will be glad to show you many examples of advanced Chevrolet engineering—in plastics and in other ways important to you. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

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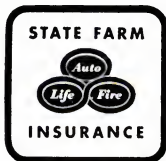
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Care and Feeding of Engines



BY
S. P. CORP

WHEN THERMOSTATS DON'T WORK

If your radiator has ever boiled dry, your thermostat may have been damaged. This would make your engine run too cool, wasting oil and gas. To test thermostat, place a .003" feeler ribbon $\frac{1}{8}$ " under lip of valve and submerge it in a container of water, 1" from bottom. Hang a thermometer in the water so the bulb is same height as thermostat. Heat slowly and stir to equalize temperature.

If thermostat drops off ribbon upon immersion, or if it opens 5° too soon or too late, you need a new thermostat.

Standard thermostats should start to open at 148° to 155° and be fully open at 175°. High-opening thermostats should start at 178° to 185°, and be wide open at 211°. When installing a new thermostat, use new gaskets and be sure side openings are placed to let water flow.

CAR RADIO STATIC

If your car radio clicks annoyingly, even when tuned between stations, it may be due to static caused by tires on certain kinds of pavement. Apply brakes lightly. If static decreases, it's tire static, and you should have static collectors on front wheels checked to see if they are greasy, or incorrectly installed. You may have to use a special static-eliminator powder, available at your parts supplier.

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Sealed Power

PISTON RINGS

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Wallpaper peels

Q—We are having trouble with the wallpaper peeling from the walls in several of the rooms in our new home. We took off the old paper and applied new, but now that is peeling in nearly all the rooms. The paper also is discolored in spots. What is the cause of the peeling and discolorations and what can I do to prevent it?

—Y.A., Ont., Can.

A—You do not say but we are assuming that the walls are plastered. Peeling of any wall covering, including paint, is a common trouble when the materials are applied before the plastered walls are thoroughly dry. Newly plastered walls should dry from two to six months before any covering is applied. Of course, this time can be greatly shortened by artificial drying but this process is seldom practical for the homeowner to carry out. Probably in your case the best thing to do is to remove the damaged paper and wash the paste residue off the walls. Then leave the walls bare for at least a couple of months during the heating season. Shut off the furnace humidifier to lower the moisture content of the air in the rooms. Then size the walls and repaper.



Moisture Problem

Q—Moisture collects on the inner side of my storm sash, and freezes to a coating of ice in cold weather. When the temperature rises, the ice melts and forms a pool of water between the inner and outer sash. In an attempt to cure the trouble, I sealed the storm sash with calking compound all the way around the window frames, but this seems to do no good as ice forms on the glass the same as before. What can I do?

—T. F., N. J.

A—Moisture-laden air is leaking through the inner sash into the space between the two units. When it reaches the outer pane the moisture condenses on the surface for the same reason that it collects on the outer surface of a tumblerful of cold

(Continued to page 226)



IN THE HOME



ON THE FARM

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GOING TRAVELING? Repair torn and scuffed leather luggage with strong Du Pont "Duco" Cement.



BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY

(Continued from page 224)

water on a warm summer day. The surface of the glass is much colder than the air. Likewise the surface of the glass in the storm sash is much colder than the air adjacent to it. Probably the surest remedy is to weatherstrip the inner sash. Of course, this takes time and may run into considerable money even though you do the job yourself. A temporary preventive is to seal the inner sash with strips of adhesive tape. Sometimes the leaks are in the lower sash only, due to a loose fit of the sash between the stops. In this case, resetting the stops may cure the trouble.

Paint Failure



Q—I painted my home less than a year ago. I applied two coats but the old paint was still in quite good condition. Now the surface of the new paint is broken into a series of fine cracks. Looks just like checked varnish. However, the checked paint is hard and is not peeling from the wood. What happened?—N. T., Del.

A—We don't know for sure but we'd suspect right away that you did not allow sufficient time for the first coat to dry thoroughly. That's a common cause of the paint failure you describe, especially if the first coat is laid on fairly heavy. Unfortunately there is no simple remedy for the condition that results. The alternatives are either to take the paint off to the bare wood with a prepared remover, or sand down the surface so that the checks are less prominent after repainting. Either method will involve considerable labor and time. In most cases we would recommend sanding, which can be done either by hand or by machine. It's a disagreeable job, but it is quite effective. Wear a respirator to prevent inhalation of the dust.

Bracing Old Buildings

Q—I have an old building on my property which not only leans a few inches out of plumb, probably due to windstorm damage, but also the ridge sags considerably, causing the sides of the building to bow outward at the eaves. Is there any way to straighten it without rebuilding?—O. F., Ind.

A—Your question is so very similar to one previously answered in this column that we are republishing our answer to the former question. Ordinarily, a building in the condition you describe is plumbed at the corners first. This usually can be done by placing long timbers, 4 x 4s or 4 x 6s, diagonally against the leaning corners and then forcing the corners back with jackscrews placed diagonally under the lower ends of the timbers. Leave these timbers in position. Now pass a short length of chain around each plate at the center and hook a tackle block to the chains so that you can exert inward pressure on the plates. Place two uprights, 4 x 4s or 4 x 6s, four to six ft. apart with their upper ends bearing against the ridge board. Place a jackscrew under the lower end of each upright. Take up the slack in the tackle block and have a helper raise the jackscrews simultaneously one or two turns. Continue this procedure by stages, keeping tension on the tackle block, until the ridge and plates have been brought back to the original position. Leave the tackle block and uprights in place and under tension. Tie the structure at the plates with 2 x 6s or 2 x 3s spaced or braced to the rafters at a point just above the plate. In some cases it is more practical to install X-braces on the rafters. In X-bracing, a common method is to spike or bolt each brace to the rafter at a point just above the plate, the other end of the brace being attached to the companion rafter about a ft. or so above the midpoint. The second brace to the pair is installed in the same manner except that it is run in the opposite direction. Install a spacer block and bolt the braces together at the point where they cross. Next, nail diagonal braces in each corner of the building, each brace extending from the plate to the floor, or sills, at the midpoint of the ends and sidewalls of the building.

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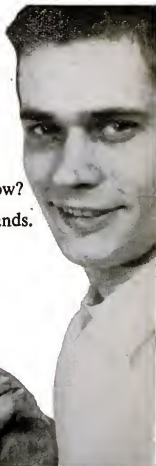
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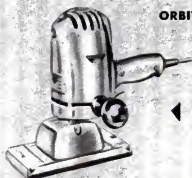
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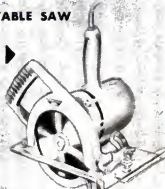


ORBITAL SANDER

A must for fine finishing. Mounts directly on the 888 Power Unit's Spindle and Spindle Housing. Uses standard abrasive sheets cut in thirds — produces "mirror" finish equal to finest cabinet work. No. 882 Orbital Sander . . . \$15.50

6-INCH PORTABLE SAW

Powered by the 888, this becomes a really fine portable saw. Cut is adjustable from 0" to $1\frac{1}{8}$ " deep. Built-in angle adjustment. Ripping guide. Telescoping saw guard. No. 881 Portable Saw with 6" combination blade . . . \$15.95



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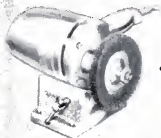
Greatest time and work saver ever developed! That's what you'll say when you realize how many projects become quick and easy with this new Millers Falls 888 Power Unit and its amazing assortment of beautifully engineered attachments.

Just as it comes, the 888 is three tools in one — a powerful (4.0 amps.) $\frac{3}{8}$ " drill — a 6" disc sander — and a 6" polisher. Add its attachments, and you

have all the power tools shown here. Yet you pay only a fraction of what it would cost to buy individually powered tools for the same work.

The 888 and its attachments are expertly designed and built to do a real man-sized job. See and try them at your dealer's. Their fine performance will more than meet your expectations. Millers Falls Company, Dept. PM-3, Greenfield, Mass.

To complete your shop just add these inexpensive attachments as you need them

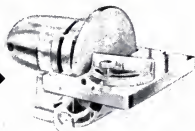


BENCH STAND

Changes the 888 from a portable to a fixed bench power unit. Used with Bench Sander, Bench Grinder, and Bench Jig Saw shown below and at right. Also ideal for use with buffing and wire brush wheels. Na. 881 Bench Stand . . . **\$2.95**

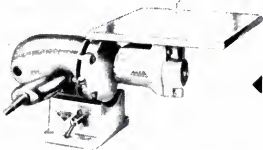
6-INCH DISC BENCH SANDER

For accurate sanding and metal polishing at angles and even at compound angles. Table— $5\frac{3}{8}$ " x 8" —tilts to 45°. Disc attaches direct to the 888 spindle. Frame bolts to 881 Stand. Complete with angle gauge and abrasive disc. Na. 889 Disc Sander **\$7.95**



4-INCH BENCH GRINDER

Converts the 888 Power Unit, mounted on the 881 Stand, into a smooth-operating grinder. Adjustable work rest, 4" wheel and wheel arbor. Na. 8810 Bench Grinder **\$5.95**



6-INCH BENCH SAW

Driven by the powerful 888 Power Unit, this saw makes cuts up to $1\frac{1}{2}$ " deep. Table top is $12\frac{1}{4}$ " x 13". Complete with cut-off and mitering gauge, rip fence, combination saw blade.

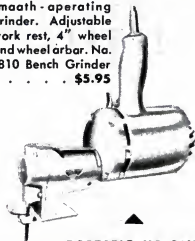
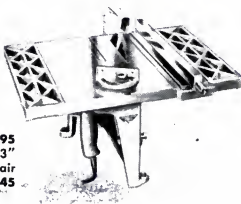
Na. 883 — Bench Saw . . . **\$22.95**

Na. 884 — Table Extensions, each 3" wide **\$4.95** per pair

Na. 885 — Saw Guard . . . **\$2.45**

BENCH JIG SAW

For cutting curves and scroll work. This saw is made up of a heavy steel table 8" x 8" which clamps onto the shoe of the 886 Jig Saw. The 888 Power Unit and 881 Stand complete the assembly. Na. 887 Jig Saw Table only . **\$1.75**



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Attached to the 888 Power Unit, this versatile tool saws curves in $\frac{3}{4}$ " wood or $\frac{1}{8}$ " metal. Cuts its own starting hole in wood. Na. 886 Jig Saw with 4 blades . **\$9.95**

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TV From A Mountaintop

(Continued from page 158)

at a bargain price. Since the mountain dwellers have an intense interest in weather, both present and future, an agreement was quickly reached. The Bureau furnished and installed valuable meteorological equipment without charge in return for observations taken by the resident TV engineers. Six observations are taken per day and immediately transmitted to the forecast center in Albuquerque by radio and telephone. Forecast service is available to the engineers at all times.

Ironically, the only damage to exposed equipment yet sustained was suffered by the weather equipment. The roof-top anemometer was mounted one evening just prior to a heavy storm. Midway of the blow, the anemometer abruptly stopped measuring wind speeds. Next morning the reason was apparent. The cups had been solidly encased and locked with ice and the wind had then unscrewed the instrument from its socket. A member of the staff estimated the wind that night, "At least 70 miles per hour—with ice." Later the equipment was reinstalled, more securely, but no subsequent storm has brought such violent conditions ... yet.

The more severe storms cause some discomfort to personnel and some damage to electronic equipment, though no insurmountable problems have arisen. Staff members say that during periods of exceptionally heavy snow, and when winds are in excess of 50 miles per hour, they experience a feeling of lethargy and lassitude and can barely force themselves to perform the most essential tasks. One particular tube in the transmitters shows an alarming tendency to fail during the same type of weather. Since each replacement for this tube costs \$50 and since there are twelve of them in the circuit, one storm could cause \$600 in blown tubes—an item not to be taken lightly by the most affluent broadcasting company.

But civilization has definitely come to the mountain to stay, despite small reverses. They say the Sandia bears and goats are shopping for another home—they have been dispossessed by TV. ★ ★ ★

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Animals Are Like Other People

(Continued from page 119)

to lighten the planes by dumping out all possible ballast—including me. Both drivers walked alongside to push the planes up the hill.

The end of that day arrived with gloom. We had gotten little more than halfway to our goal. Our food had run out. The gas supply was dangerously low. There was a strong possibility we might end up walking out on snowshoes.

Suddenly Holly shouted, "If Colter made it through here in winter with only a rifle and snowshoes, we sure can with these planes!" And we did! The first night was rough, but the next day we moved on to pick up emergency gas and food supplies. And the next day we also got our first shots of buffalo plodding through snow that reached a foot above their bellies.

The reaction of our horses to buffalo or grizzlies was critical. If they shied from them our trip would be a failure. The test came the first evening when two grizzlies started to hunt down the meadow toward our horses. The bears reared up on their hind legs and looked over the horses. I also reared up and looked more closely—this display could cost us \$150, the value of the two horses. Suddenly one horse decided the bears had moved close enough into his meadow. In one charge he made the bewildered bear beat a hasty retreat.

Buffalo gave us some more anxious moments while we were photographing their battles during the mating season. One ornery bull almost wiped out both of us and both horses because we inadvertently stood in the fresh trail that he was following. Other buffalo charged angrily toward me when I was on the treeless meadows. Retreating under such conditions would be foolish—the buffalo could easily outrun any human. Furthermore, they're more apt to chase you when you retreat. With my heart in my mouth, I stood still and watched each animal thunder toward me. And my bluff worked! Each one stopped about 20 feet away and paused long enough to let me retreat slowly backwards while still facing it.

Charging buffalo, striking rattlesnakes, prairie fires, prairie floods, snowplane trips—these were the more spectacular moments during the filming of *The Vanishing Prairie*. There were other less dramatic yet just as fascinating moments. They were characterized by one quality—*patience*. More than anything else, this film required an endless amount of patient spying on all prairie creatures to film their lives as they lived them. ★ ★ ★

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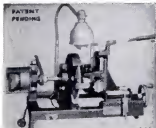
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Clymer Tests the Cadillac

(Continued from page 123)

speeds with no evidence of vibration. It develops a maximum of 230-horsepower with an 8.25 compression ratio and 331-cubic-inch displacement.

According to the factory, no basic change was made to get the additional 20 horsepower over the 1953 rating of 210 at 4000 revolutions per minute. But the 1954 engine gets its advertised 230 horsepower at the higher engine speed of 4400 revolutions per minute. It has the same compression ratio, same internal dimensions, same four-barrel carburetor and dual exhaust system. New are a 12-volt ignition system and electrical components.

Cadillac is a fast road car. The speedometer needle pushed above the maximum 110 mile-per-hour mark on the dial during long, straight stretches. The speedometer is fast by about five percent.

The 1954 brakes have 12-inch ribbed, cast-iron drums and 211.55 square inches of effective lining area. Although this area is considerably less than the 1953 version (258.5 square inches), the cutting of a ½-inch groove in the primary lining (reducing total area) has provided more even heat distribution and therefore more effective braking. The brakes showed no evidence of fading.

Both test cars were loaded with all the electrical accessories available. With this heavy load, the 12-volt system is a definite improvement over the 6-volt system.

The four-speed Hydra-Matic permits rear-axle ratios of 3.07 (standard) and 3.36 (in air-conditioned cars), both being excellent for gasoline economy.

Cadillac's all-new styling gives an unusually low appearance and it grows on a person the longer he drives the car, especially the wrap-around windshield. There is a sturdy feeling about the doors, hood and other body parts. Doors open and close easily. No rattles, squeaks or leaks developed during my tests. The new frame with its double-cross bracing eliminates twist and makes body and chassis more rigid.

Though the hood is long, wide and high, vision directly in front of the wheels is good. The wrap-around windshield and the large window area afford better-than-ever vision.

The front grille is large and massive. I do not like the two bullet-shaped projections at the front of the bumper. In pushing another car or in parking, these projections do not always line up with the opposing bumper. I cannot see that they

(Continued to page 238)

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Now . . . rotary drill any masonry in your home with ease! New Carboloy "Live-Spiral" Masonry Drills bite cleanly through brick, slate, tile, concrete or cast stone. Won't stick, stall, bind.

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Chicago Daily News photo

TV Aids Elevator Starter

Closed-circuit TV in Chicago's Merchandise Mart lets the elevator starter gauge the traffic on the second floor as well as the first. Since the building has entrances on both levels, traffic is equally divided. A camera on the second floor relays a picture to a 21-inch receiver before the starter on the first floor. He looks up at his screen, watches a crowd gather before the second-floor elevators and knows just when to send up a car.

Extend Oil Life

Longer life for the oil in your car is predicted by the Canadian National Research Council. Experiments show that the addition of lithium, potassium, magnesium or their salts or oxides, in certain quantities, has the effect of braking the oxidation that gradually destroys the properties of ordinary motor oil. A piece of protective metal could be built into the oil filter.

Curled Strips Bind Notebook



Curled ends of plastic binding strips for a notebook make the addition or withdrawal of pages an easy task. The sturdy strips hold the binder together firmly. The new twist in plastic is from France.

Clean both sides INDOORS!



You can clean or paint both sides of a removable R.O.W. window from *inside* the house—no need for ladders or sitting on sills.

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No nails or bolts... use 2x4's for legs. 2x4 or wider for crossbar. Rugged, sturdy, easy to move, saves storage space. Sold by hardware and building material dealers, or order direct

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The Gem Maker comes complete with all necessary equipment, including a super-charged diamond blade for sawing, and all wheels for grinding, shaping and polishing; also complete instructions. The complete equipment as shown, less motor and belt, for only \$29.50, f.o.b., Burlington, Wisconsin. Write today for information and literature.

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Dept. 5 Burlington, Wis.



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Wonder-Paste makes paint, varnish, enamel come off easily—not coat by coat, but all in one scraping. Clings to upright surfaces. Use it on furniture, trim, floors, etc. At paint and hardware stores.

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serve any purpose other than ornamental. They are certainly not practical and should be eliminated in favor of a bumper that would offer more front-end protection.

The trunk is large and the self-locking lid is easy to open and close. Dual mufflers are standard. Twin exhaust pipes extend through each end of the rear bumper. This adds to appearance and the dual exhaust does improve performance somewhat.

The instrument panel is massive and its top is covered with a fabric to eliminate sun glare. The edge, although rather sharp, is cushioned with sponge rubber to afford some protection in case of impact. I don't like the red warning light that indicates battery discharge. Needle gauges are better.

My test models were equipped with the Autronic Eye headlight-dimming unit. While this is convenient at times, it occasionally operates unnecessarily and is annoying. I found that the brilliant lights of service stations would sometimes cause dimming of lights.

GM's air-conditioning system is somewhat complicated. The body seems to be honeycombed with ducts, scoops and vents, but the unit itself is highly efficient and simple to operate. An evaporator and two blowers are located in the trunk and there is a fresh-air intake on each side of the body near the rear window. A control switch puts the air conditioner in operation within 3 to 5 minutes. Two blowers, one for each side of the passenger compartment, control the amount of cool air. It is a little noisy when the blowers are on high.

The car took the bumps with a feeling of security and the ride is certainly an easy one. The front end is still somewhat soft for the driver who likes to corner fast. The car "floats" over the rough spots with no tendency to hop around on corners or over sharp bumps.

I like the power-steering unit as there is always a slight pressure on the wheel. This long-and-low car, with its large body, is easier to handle and park than you might expect. Power steering is standard on all Cadillacs this year. The steering ratio of four turns from lock to lock is satisfactory and steering is almost effortless. ★ ★ ★

Aircraft Industry Tops Automotive

Top employer of manufacturing workers in the United States is now the aircraft industry, with 823,000 on the payrolls. The automobile industry, which formerly led, employs 786,000. Once before, during World War II, the aircraft industry ranked first. But it fell to 16th place in 1946.

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AMAZING, PERMANENT MAGNETS—WILL NOT WEAKEN! NON-ELECTRIC. Retrieve guns, tackle, tools and other steel items from lake, river, plating tanks, drains or other hard-to-reach spots. Recover drills, taps, etc. from sweeping, clear alley of harmful tacks, nails. Many other uses. Pays for itself quickly. GUARANTEED. Try any magnet one week. Money refunded if you are not well pleased.

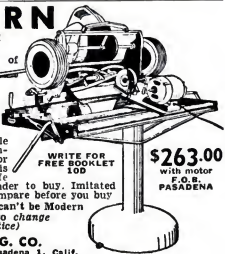
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Send Money Order or Check. We pay postage. No C.O.D.'s.
MIAMI MAGNET COMPANY, 3240 N. W. 27th Ave., Miami 42, Fla.

COLOR PRINTS 32¢—big, brilliant Kodacolor Prints, 3½x5 inches, from 2x2 slides—only 32 cents each, plus 30 cents for negative from each slide from which prints are to be made. Minimum charge, \$1. Order from your dealer.

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Service departments of leading Lawn Mower manufacturers use the Modern Lawn Mower Sharpener. One lever moves lawn mower into grinding position. Gasoline and oil remain in engine while sharpening. No dismantling of wheels, roller or handle. The Modern is a precision bed knife grinder—no extra grinder to buy. Imitated but never equalled—Compare before you buy. If it isn't a Modern it can't be Modern (Prices subject to change without notice)



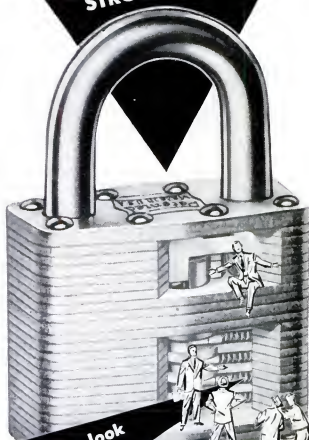
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Richer, Creamier, **AERO SHAVE** Saves 20¢ a Can!

Just Push Valve
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AERO SHAVE Lather Bomb

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GARAGE DOOR

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The construction plan for this door is adaptable to openings of many sizes. Light and easy to operate, the door swings up on standard overhead garage door hardware. **You build without blueprints!** Our simplified East-Bld* Pattern No. 86 shows you how to cut each piece to exact size—specifies all materials required—shows how to assemble and install the finished door.

You save up to two-thirds of the usual cost!

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NEW! Three illustrated folders suggesting 18 practical make-it-at-home projects ranging from the attic to the cellar. Clip or copy the coupon—mail today for pattern and/or folders.

*T. M. Reg. East-Bld Pattern Company

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I enclose: ☐ 10¢ for three folders ☐ 50¢ for Pattern #86

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My lumber dealer is.....



Cadillac's air conditioner introduces cooled air into body through four outlets similar to those on planes

Owners Report on the Cadillac

(Continued from page 126)

half are businessmen (33 percent owning their own business and 20 percent being executives in a business). Professional men (doctors, lawyers, dentists) make up another 14 percent of the owners. Salesmen account for 7 percent and retired owners for another 6 percent. Included among the miscellaneous occupations was one mechanic in an automobile factory, the only factory worker in the survey.

Most of the owners have two or more cars in the family, 69 percent to be exact. The most popular second car is another Cadillac with 26 percent owning two of them. Ford was next with 15 percent, Chevrolet third with 14 percent and Oldsmobile fourth with 11 percent. A tiny percentage own a sports model as the second car.

When asked what they use the second car for, owners gave a variety of answers.

(Continued to page 242)

Apparently Cadillac owners do wash their own cars. Many said the "waffle" grille is too hard to clean



**PICTURED PERFECTION —
BULLDOG
TRAILER PARKING JACKS!**



MODEL 50-P makes hitching or parking trailers an easy, one-man job. Rides flush. Easily installed. \$15.37 complete, Fed. Ex. Tax included, F. O. B. Wausau.

Manufacturers of a complete line of trailer axles, couplers and jacks. Write for Brochure 13-1

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"As old as the Industry!"
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Travelite Only \$5.49 Illuminated

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BUILD FINE GRANDFATHER CLOCK NOW

The simple sensitive Red-i-Kut way as thousands have — SAVE HALF SHOP TEST! — **"SPIRIT OF THE CENTURY"**. Narrow waist, 8 1/2" tall or stately straight side — **"SPIRIT OF AMERICA"**. EASY-TO-FOLLOW pictorial PLANS tell all — plus BROCHURE of heavy brass weight Westminster tube chime, movements, gorgeous dials, 3 1/2" solid mahogany case kits. Send \$1.00 today — Both plans \$1.50 NOW.

KUEMPEL CHIME CLOCK CO., #7 Kuempel Bldg., Minneapolis 16, Minn.

NEW, IMPROVED CALCULATOR FOR WOODWORKERS only 25c



Instantly gives information on lumber, nails, concrete mixes, painting materials, etc. Convenient, simple to read. Just set dial for nail specifications, to convert linear to board feet, find bit sizes for screws, compare characteristics of woods. 6" diameter heavily varnished cardboard. Send 25c, no stamps, please to Greenlee Tool Co., 2109 Columbia Avenue, Rockford, Illinois.

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Sell the Wheelhorse.
Dealerships open! Write today

Wheelhorse
Makes gardening easier — adds to your leisure!



FREE Catalog! Send Postcard today!

Only **\$149.50**
2 h.p. model

You'll buy a Wheelhorse when you compare price... construction... design and ease of handling! Easy to change attachments help you plow, cultivate, harrow, haul, spray, mow, saw, cut, roll, plow snow. Guaranteed! 2, 2 1/2, 3 and 3 1/2 h.p. models. Write!

POND COMPANY
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New Easy Way to DRY CLEAN RUGS

...Earn Big Money!



Only AMERICAN has it!

New wonder-way to dry clean rugs can start you earning *big money* every day! Full or part time. Homes, stores, offices are prospects! Amazing American ALM-13 machine with exclusive new Float-Action Whirling Brush does the work—so easy a child can operate it! Just spread dry-cleaning material on rug... then guide machine while brush whirls this material thoroughly into fibers of rug. Out comes grease, grime and deep-down dirt! Pick up with vacuum. Rug can be used immediately. Clean rugs on location. No hand scrubbing. Does professional job in a jiffy... makes rugs new-looking! Minimum investment. Write today for details!

Make extra profits—use same machine to clean floors, too! Easy-to-use ALM-13 does five floor jobs with no-tool attachments... scrubbing, steel wooling, buffing, polishing, waxing... wood, rubber, asphalt, linoleum... make money on *all* floors!



BIG PAY SANDING FLOORS

Get ahead in fast-growing building field! Be a floor surfacing contractor and sand both new and old floors. No experience needed. High earnings, steady work with a future! Write for booklet "Opportunities in Floor Surfacing," enclosing 25 cents in coin or stamps to cover handling.

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SEND!

The American Floor Surfacing Machine Co.
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- ☐ Send full details on new easy way to Dry Clean Rugs and make money!
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HOW TO QUIET YOUR CAR

—and do "1001" jobs around the house



FREE "Tips to the Handyman" folder shows over 40 ways you can use L·O·F Super-Fine.

This handy free folder shows you how to do a variety of jobs around the house with fine-fibered, easy-to-apply Super-Fine Fiber-Glass. A few of the suggested uses include: **Hot-water tank wrap • Garage-wall insulation • Milk-box liner • Comforter padding • Shrubby wrap • Auto tool wrap.**

Buy Super-Fine from your local hardware, lumber, or building supply dealer.



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Fiber-Glass Division
48-94 Wayne Building
Toledo 3, Ohio

Please send me, FREE "Tips to the Handyman" folder, showing how to quiet my car and make over 40 household improvements with Super-Fine Fiber-Glass.

Name

Address

City Zone State

Here are a few answers taken at random: "Pleasure." "Business and sport trips." "Fishing and hunting." "Running errands."

Owners Like the Cad's Fins

By an outstanding margin, Cadillac owners expressed a liking of the car's "trade-mark," its tail fins. A mere 7 percent did not like them, but many of this minority found fault only with the 1954 version, not

1954 CADILLAC Specifications

ENGINE

Type 8-cyl., V-type, OHV
Bore and stroke 3.8125 x 3.625 in.
Piston displacement 331 cu. in.
Compression ratio 8.25:1
Brake horsepower 230 at 4400 r.p.m.
Transmission Hydro-Matic, Dual-Range

CAPACITIES

Oil 5 qt.
Water (with heater) 22 qt.
Gasoline 20 gal.

GENERAL

Series 62 Series 60 Special

Steering ratio (over-all)	21.3:1 (power steering std.)	
Steering wheel, lock-to-lock	4 turns	
Turning diameter (curb to curb)	45.1 ft.	46.3 ft.
Brakes	conventional hydraulic	
Tire size	8.00 x 15	
Recommended pressures	24 lb. front and rear	
Shipping weight (4-dr.)	4330 lb.	4490 lb.
Wheelbase	129 in.	133 in.
Tread, front	60 in.	
Tread, rear	63.1 in.	
Height, over-all (4-dr. unladen)	64.1 in.	
Width, over-all (4-dr.)	80.0 in.	227.4
Length, over-all (4-dr.)	216.4 in.	
Road clearance	6.15 in.	

INTERIOR DIMENSIONS

Front-seat width	63.9 in.	64.2
Rear-seat width	65.2 in.	
Headroom, front	35.8 in.	
Headroom, rear	35.6 in.	
Legroom, front	43.2 in.	
Legroom, rear	45.8 in.	

the tail-fin idea. It is looked upon as a distinctive mark by most owners. This year's design also has a functional purpose in that both fins can be seen by the driver when backing up.

"It is easy to tell exactly where your rear end is when backing up."—Kansas City, Mo., advertising man.

"Distinctive in appearance."—Perth Amboy, N. J., doctor.

Here are some of the objectors:

"Fins too big this year. Looked better on 1953 models."—Portland, Ore., dentist.

"Easily bumped when parking."—Cleveland, Ohio, salesman.

"Too ostentatious."—Worcester, Mass., consulting engineer.

(Continued to page 244)

DRILL SAW REAM CUT **INTERNATIONAL** **HI-SPEED COPE SAW DRILL BIT**



DRILL, SAW, REAM . . . metal, pipe, wood, plastic, Transite, etc. Use with any electric drill, slow drill press, lathe or milling machine. Drills own starting hole—upper part of bit is used to cut, saw or ream circles, ovals, squares or scrolls. Easy to operate. Ideal for carpenters, mechanics, electricians, plumbers, hobbyists, many others. Abrasive resistant, high speed steel. Flutes ground from solid. Will withstand severe continuous use without breaking. Resharp-ened at no charge. Takes place of up to \$50 in tools. 1/4" diameter, 2" cutting sections, total length 3 1/2". Available in three types—All Purpose, Wood, Heavy Metal. Specify type needed. Set of 3, \$11.50. Details on request. Shipped same day. Money-back guarantee. Dealer inquiries invited. ORDER NOW! SEND CASH, CHECK OR MONEY ORDER.

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MONEY for MEN ALL FREE

THE PLASTEX Industry needs manufacturers on small scale and for big production of Lamp and Clock stands, Art Goods and Novelties in Plastics and Marble imitation. Experience unnecessary. Age material makes popular 10¢ store sellers. Rubber models furnished for speed production. Small investment brings good returns. We are now placing big Chain Store Orders with manufacturers. Ambitious men have chance for real prosperity. Our Free booklet will interest and benefit you.

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STARRETT "Tools and Rules" BOOK

Describes and illustrates the precision methods skilled mechanics use. Only one dime. Write Dept. AP.

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"SNOOPER" GEIGER COUNTER

Super-sensitive! Only 1 1/4 lbs. Fits pocket—uses flashlight battery. Find a fortune in uranium. Order Now! Send \$5.00, balance C.O.D. MONEY BACK GUARANTEE. FREE CATALOG—scintillator and larger uranium and metal detectors DEALERS WANTED.

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EARN YOUR OWN KING MIDGET. We want rider agents to demonstrate and sell the World's Lowest Priced Automobile. Fully assembled or bolt together parts. If there is no dealer near you send 25¢ for detailed literature with agents proposition, or \$1 (refund first order) for this plus actual assembly book and service manual.
MIDGET MOTORS MANUFACTURING CO., ATHENS 1, OHIO

World's #1 Brush Gun . . .
MARLIN .35 CAL.

Now Only \$68.95*

Tremendous Demand . . . Expanded Production . . . Permit \$10 Reduction on Three Marlin Cal. .35 Rem. Models!

HERE'S the only gun in this brush-blasting caliber that provides the split-second speed of lever action.

A terrific value . . . a tremendous favorite . . . at its original price of \$78.95! Practically a "steal" now—at only \$68.95*!

Available in carbine, rifle and deluxe rifle models—the carbine with regular pistol grip . . . or "Texan" style, with straight grip. See your Marlin dealer now (name of one nearest you available on request). Many Marlin dealers have a layaway plan. Ask your dealer about it. Marlin Guns are also sold in Canada.

Model 336—.35 Rem. Carbine—full magazine holding 6 shots. Reduced to **\$68.95***

* Prices slightly higher west of Rockies.

THE NAME FOR GAME

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FINE GUNS SINCE 1870

VALUABLE COUPON—MAIL TODAY!

The Marlin Firearms Co., Dept. 9-PM, New Haven, Conn. Send me catalogue with information and photo-illustrations of Marlin Guns, plus new cartoon booklet, "More Fun with Your .22 Rifle." Also send me a pack of (check preference) ☐ single or ☐ double edge Marlin Razor Blades. I enclose 10¢ for handling.

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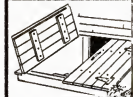
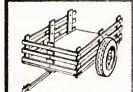
TEENUTS

steel threads in wood

TEENUTS mount flush without counter-boring. Excellent for new work or repairs... wood to wood, wood to metal... and where old screw holes have worn out. Simply drill hole for TEENUT barrel, hammer home TEENUT and its steel prongs provide rigid, permanent anchorage. Same size hole for bolt. Sizes to fit standard bolts: 6-32, 8-32, 10-24, 10-32 (4 per card), 1/4-20 (3 per card), 5/16-18, 3/8-16 (2 per card).

AT HARDWARE COUNTERS
EVERYWHERE 15¢

per card



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FREE! for every
Household
Handy man!

101
ILLUSTRATIONS
AND INSTRUCTIONS



Anything made of wood—and this folder illustrates 101 items—should have the water repellency, resistance against warping, swelling and shrinking—and immunity against termites and decay—made possible with Woodlife.

WOODLIFE is the original water repellent wood preservative that should be on every handyman's work shelf—along with this folder which shows how to apply Woodlife to 101 household wood-working projects.

Ask your lumber, paint or hardware dealer for Woodlife and for your copy of this informative "do it yourself" folder or write,



Protection Products MANUFACTURING COMPANY

Dept. O Kalamazoo, Michigan
When you repair, remodel or build, ALWAYS ask for Woodlife treated lumber!

Always good for a laugh is the joke about "times getting so tough that owners have to wash their own Cadillacs." Well, apparently that isn't so funny as it appears. Cadillac owners do wash their own cars, the survey shows. When asked about the new and unusual front grille and bumper, some Cadillac owners complained that the grille was too difficult to wash.

"Too complicated and hard to clean."—Crescent City, Calif., merchant.

"Grille mesh is so small it is difficult to keep clean."—Mt. Prospect, Ill., paving contractor.

A fairly large percentage of owners did not like the grille: 28 percent. Other reasons for this include the following:

"Bumper doesn't protect lower part of the grille."—Pomona, Calif., real-estate broker.

"Grille too fragile."—Walled Lake, Mich., resort owner.

But the majority likes the grille and bumper. Included is a Galesburg, Ill., doctor who wrote the design "creates an illusion of massiveness."

"The front bumper is very pretty, but the two bulbs sticking out in front are very dangerous and could easily kill someone. The car cannot bump another car without damage to these and they are expensive to replace."—Chicago, Ill., merchant.

Miscellaneous Comments

Cadillac owners make many interesting comments that, while not always typical, are worth repeating.

"I don't like the floor covering. The odor inside for a month or two was sickening."—E. Brewster, Mass., housewife.

"Very unpleasant sounding, blarey horns."—Saugerties, N. Y., manufacturer.

"Controls for window lifts are very poorly located and not convenient to operate."—Brooklyn, N. Y., businessman.

"Heater is definitely bad. Drafty. Too hot or too cold."—Decatur, Ala., realtor.

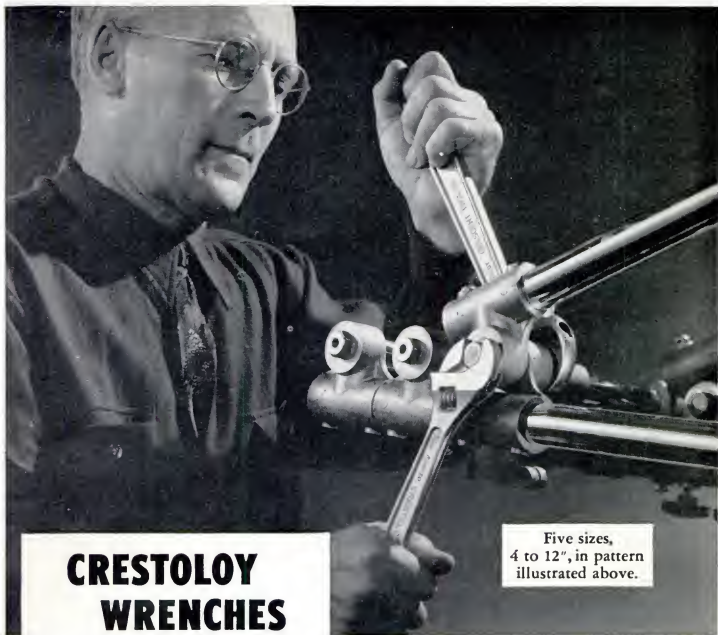
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"Rear exhaust extensions do not allow the Caddy to be pushed easily."—Pelham, N. Y., wholesale salesman.

"Ash tray not convenient for driver. Mud drains from front fenders down over bumpers."—Charleston, W. Va., owner.

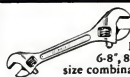
(Continued to page 250)



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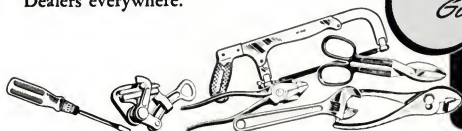
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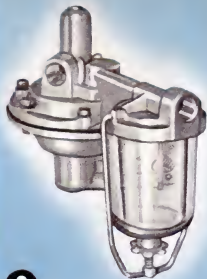
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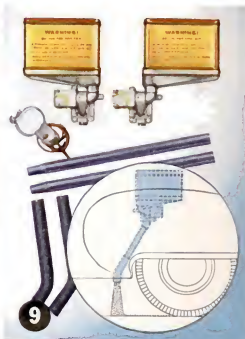
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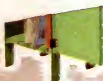
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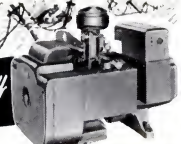
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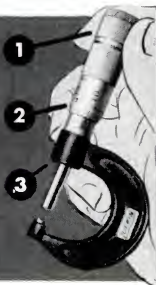
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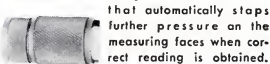
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Dealer-service ratings were just average with 45 percent saying their dealers were excellent, 26 percent good, 19 percent fair and 10 percent poor.

For Floyd Clymer's road test of the 1954 Cadillac, turn back to page 123. ★ ★ ★

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Fast Horses and Short Ropes

(Continued from page 136)

wind had quickly fanned the blaze. By the time Rude and Caldwell got the trailer gate open a wild-eyed horse was frantically trying to side-step flames that were flickering over his left foreleg from shoulder to hoof. He jumped free when the tail gate crashed down, the flesh of his leg scorched and sizzling. But he recovered to become a famous rope horse.

For the three men who roped off him during the 1947 rodeo season—Fort, Jack Skipworth and Cotton Lee—Baldy won \$43,000. In the first two months of 1949 he won Fort and Skipworth an amazing \$10,000 in only four rodeos. At Tucson, Ariz., that year his two riders tied for first place in the two-calf-average roping by securing their stock in identical times—35.3 seconds.

Like the ropers themselves, the best of horses occasionally foul up. To the Madison Square Garden rodeo in the early 1930s came Jake McClure and his wonderful sorrel gelding, Silver. Both McClure and a friend, Richard Merchant, were roping off the horse.

Preliminary to Merchant's run, the announcer started praising Silver. He couldn't say enough glowing words about the great little horse that once had been awarded the Prince of Wales Trophy as the best rope horse at the Calgary Stampede in Alberta, Canada. He was without doubt "the best... the greatest... the most well-mannered..." Then Merchant came out after his calf.

He missed his first loop, but caught with a second rope. The first rope, trailing from the saddle, scared Silver (McClure very seldom missed his first loop) so much that he bucked Merchant off and ran for the exit gate, pulling the calf behind him. Of course, Merchant received "no time."

When Silver was hit and killed by a car in 1937, McClure was heartbroken. McClure's own life was prematurely snuffed out in 1940 when he roped a steer on his ranch to look at the brand. The steer jerked McClure's horse over on top of him and he never regained consciousness. He will long be remembered for his ability to catch calves with a small loop—the one Will Rogers called the "wedding-ring loop of rodeo."

Luck plays a large part in roping. The roper who draws one or two slow calves in a calf-roping event will win. Although rodeo-stock contractors do their best to cull weak, slow calves from the roping herd, a couple of soft calves will always turn up out of a 100-head herd.

Thus professional calf ropers recognize

(Continued to page 254)

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no world's records for fast times. Variations in arena size and the breeds of calves also automatically prohibit national records, although individual arena records are kept.

However, here are a few fast times: Buckshot Sorrells at Crystal City, Tex., in 11.2; Cotton Lee at Plainview, Tex., in 10.4; Jim Bob Altizer at Rosenberg, Tex., in 9.9 and Jack Saunders at Euless, Tex., in 9.8.

Because of the shorter start given the calves, times at indoor shows are generally faster than those at outdoor shows. Twenty years ago at Tucson the calves got an 80-foot start, and any tie under 25 seconds was really "hustlin'."

Calf roping is becoming more appealing; Texas high schools send a representative boy each year to Hallettsville to compete in a championship rodeo. The Intercollegiate Rodeo Association boasts a top array of roping talent from Texas, New Mexico, Arizona, California and Colorado colleges. Some of the roping students make a career of it. F. C. Stover, paid his way through college with his money-winning loop.

A red piggin' string in the corral doesn't mean a calf has kicked a cowboy in the mouth. It's lipstick! Even the girls are organized—the Girls Rodeo Association is 15 years old and some of the members are real hands.

Twenty-two-year-old Wanda Harper, of Mason, Tex., has been roping calves over half her life. Once at Laramie, Wyo., during the girl's calf-roping contest, Wanda roped a calf that went through the fence just after the loop tightened around its neck. Wanda didn't hesitate a second. Off her horse she sprang and scrambled through the fence.

"Little old fence like that wasn't about to stop me," said Wanda after she had tied the calf and remounted her horse.

The two current calf-roping champions of the two rodeo associations are B. J. Pierce of Clovis, N. Mex., and Don McLaughlin of Smithfield, Tex. A bespectacled college graduate who looks more like a schoolteacher than a roper, Pierce is the International Rodeo Association's champ. His best performance of the past season was in November at San Francisco's Cow Palace rodeo. After missing his first go-round calf, Pierce won the second and third go-rounds by tying calves in 12.6 and 12.5 seconds to win \$1565.86.

McLaughlin, a former trick roper and fancy rope spinner, is one of the toughest competitors on the circuit. Last year he won about \$20,000. Rough calves often throw this slight roper for a loss, but on small calves he has a lightning tie.

I think a big change has come in public

(Continued to page 256)

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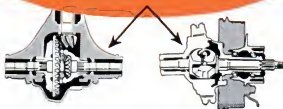
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attitude toward roping and other rodeo events. The ropers, too, look on rodeo now as more of a money-making business than a rip-roaring pastime. But only a few years ago rodeo ropers were called "carnival boys." They were talked about disparagingly and regarded with a dim view, a justifiable outlook since many of them were real bums, cashing in on rodeo in any way they could.

It's different now. The men of rodeo are a sincere bunch. They are professional athletes, regardless of what names press agents care to call them. They win only what they get by beating their roping opponents; most of them rope for a livelihood. Some, like Pierce and Stover, are college graduates; others have been sports stars in high school or college.

Still others are Easterners gone Western, in a complete way, for calf roping is no longer a cowboy's game. Anyone who is coordinated, can ride a horse and is not afraid to practice, can learn to rope calves well. One of the good ropers, Lex Connelly, now of Fresno, Calif., was born and reared in Bryn Mawr, Pa.

Like other spectator sports, roping calves against time has taken on a standard of competitive excellence that is hard to beat. Ropers have developed themselves and their mounts into slick, smooth-working teams that are a downright pleasure to watch. ★ ★ ★

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Hard wood is easier to plane if you dampen the surface first. Be sure you wipe the plane dry afterwards, though; otherwise you'll have to buy some more Emery Cloth to remove the rust!

You can keep knobs from loosening on your dresser drawers and other furniture this way: Cut small "washers" from a sheet of Medium Flint Paper by CARBORUNDUM. Insert them between the knob and drawer, grain side out. Then tighten the screw that holds the knob. The Flint "bites" into the base of the knob—keeps it from turning.

Asphalt tile floors with cracks or chips can be temporarily repaired with sealing wax. Melt enough wax over the spot so it fills the break or hole—plus a little extra. Let it cool, then sand it down to floor level with a small sheet of Fine Flint Paper.

It's easy to remove burrs from metal edges. Clamp the metal to your bench, or in your vise. Tear a 1" strip from a sheet of Fine or Medium Emery Cloth by CARBORUNDUM. Grip one end in each hand and sand the edge in "shoe-shine" fashion.

There's no such thing as "sandpaper" anymore! And you can be mighty glad about it, for CARBORUNDUM Brand Flint Paper, Garnet Paper, Emery Cloth, and ALOXITE® aluminum oxide Paper and Cloth are so far superior to old-fashioned "sandpapers" it isn't funny! Your hardware or lumber dealer will help you choose the right product for each job. Just insist on the CARBORUNDUM Brand name on every sheet you buy.

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90-439 I

What's All This Talk About Hi-Fi?

(Continued from page 110)

a small cone (tweeter) for the highs, and even a third speaker for the midrange. A "coaxial" speaker has a tweeter built into the center of the woofer. A "cross-over network" should be used to separate the signals and feed each speaker the ones it can handle best.

Many hi-fi fans start on a small budget and improve their systems from time to time. Instead of buying separate speakers or a coaxial, you could begin with a single "extended range" unit. Later you may want to add a tweeter and a cross-over network which will turn your old speaker into a woofer. If you choose this course, make sure that matched, add-on components are available for your speaker. There are a number of progressive systems on the market that help put hi-fi on a pay-as-you-go basis.

If you ear-test woofer-tweeter combinations, beware of a trick your ear may want to play. Adding a tweeter increases treble sound but sometimes makes it seem as if the bass tones had been chopped off. Tone controls are included in some cross-over networks to permit you to restore an ear-pleasing balance.

Power, in watts, tells you how much volume a speaker can handle. Normal listening level is only about one watt, but a hefty reserve of power is by no means wasted. Sharp peaks and loud passages occur very often in music. If they overload the speaker—even for an instant—they will mush up the sound and may eventually damage the speaker. Your speaker system should be able to handle at least the output power of the amplifier it will be used with, and preferably a good bit more.

Amplifiers—An amplifier receives feeble signals from a phono pickup or radio tuner and gives them the power they need to pump a speaker. Even very modest ones are more faithful to the signal than the best speakers. You will want at least 10 watts of output power (like the speaker's, it is for reserve rather than use). Catalog figures on distortion should be well below that of the speaker, and you should not be able to hear hum at any volume setting.

It is wise to get an amplifier that has a "flat response" from below 50 cycles to 15,000 or above. This means that within this range it amplifies signals uniformly.

[ED. NOTE: In sales literature this is indicated as a line on a graph, or abbreviated "50 to 15,000 cps ± 2 db." The last part means "cycles per second, plus-or-minus 2 decibels (a unit of sound change). A small

(Continued to page 260)

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So go to your motor specialist at the first sign of oil-pumping or performance drop-off. If rings are the trouble, ask him to install a Hastings Steel-Vent replacement set. Truly the best money you can spend on your car!

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Regular or Chrome

**TOUGH on Oil-Pumping
GENTLE on Cylinder walls**



variation of 2 db or less over the whole frequency band should be satisfactory, since 3 db is about the lowest level of sound change the ear can hear.]

Some amplifiers range to 100,000 cycles or more. You can't hear such ultrasonics, but the electronic refinements of these amplifiers push distortion and hum below the vanishing point. They are expensive.

In the old days an amplifier was all you needed between a phonograph pickup and a loudspeaker. Today's high-fidelity pickups have added a new element—the preamplifier. The preamp is required by today's variable-reluctance magnetic cartridges, which are extremely sensitive but produce signals that need more amplification than the amplifier alone provides. Sometimes the preamp and amplifier are built in one, or the preamp may be part of a radio tuner.

Good tone controls are usually worth having. They let you balance the sound to your own taste or to the acoustics of your home. The better outfits have separate controls for bass and treble, but some very satisfactory controls adjust both high and low tones at the same time. One mark of a good control is that it doesn't change the over-all volume.

Record Players—Like speakers, the turntables and pickups that play your records are chiefly mechanical devices. Shortly after the war, General Electric introduced the low-priced variable-reluctance magnetic pickup. Its needle or stylus was able to follow the record groove accurately and freely. This pickup has since been improved; so have other types of magnetic, crystal, ceramic and capacitive cartridges. You can get hi-fi from a well-made unit of any type but the variable-reluctance magnetic group is by far the most popular.

Whether you start with it or not, you may want to switch to one later on. To allow for this possibility the phonograph motor you buy must be of the four-pole type. A less expensive two-pole motor has a magnetic field which will induce hum.

Medium-priced turntables or record changers are probably good enough for most nonprofessional installations. High-priced tables are excellent, but it's doubtful whether they can improve sound enough for you to hear.

In the long run the pickup arm that carries the cartridge is likely to be more important than the motor and turntable. The arm must be critically balanced so the stylus will follow the groove at present flyspeck pressures. The arm mustn't bounce and it must hold the stylus at the correct angle from the outside groove to

(Continued to page 262)

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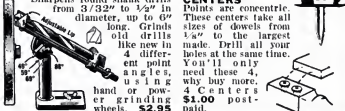
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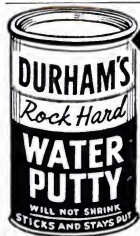
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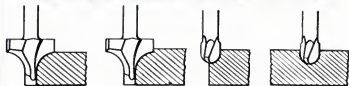
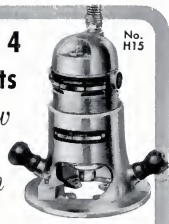


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the innermost one. If you buy a separate motor and arm it will be worth your while to have them mounted by an expert. You can also get premounted motor and arm combinations.

In hi-fi circles, both metal-tipped and all-purpose, three-way needles are considered most unsatisfactory. Neither does justice to sound and both scratch the records. Some fans give grudging approval to sapphire-tipped needles. The argument against this type is that record grooves grind cutting edges on the soft jewel. After 50 plays or so it begins to chisel the sound tracks out of your records. Purists insist that nothing but a diamond—and a well-mounted diamond, at that—is good enough. A popular compromise is to use a sapphire for old 78 records and a diamond for microgrooves.

Radio Tuners—There's a lot of good music on the air that you can pull in with a radio receiver linked to an amplifier and speaker. Separate tuners are available for wide-range FM and standard AM broadcasts, or you can get a single unit that will receive both.

Qualitywise, look for hum suppression and freedom from distortion at least equal to the amplifier's. The sound-frequency response of the FM section should be flatter and wider than that of the amplifier. Both AM and FM sections should be able to receive all stations in your area and separate them cleanly. And you will be happier with an FM tuner that has a drift compensator—a circuit that keeps stations sharply tuned in.

Cabineting—As a rule, it is advisable to place the amplifier and speaker fairly close together. If you plan a spread-out installation, it is possible to get matched components that have all controls and switches on the preamp or tuner. A basic no-knob amplifier can be hidden away in or near the speaker cabinet and forgotten.

A single cabinet for all components may be adequate, but in fancy installations the speaker and record player are usually placed in separate boxes so sound vibrations can't rattle the pickup. There are many good cabinets in hi-fi shops.

And if you're a person who's afraid he'll have to take on technical headaches in order to enjoy hi-fi, stop worrying. There are a number of factory-assembled sets being made today that produce excellent sound and have the advantage of being quality matched throughout.

However you do it, and at whatever price level, you won't be sorry for getting in on the new hi-fi. Sound is busting its seams. There's a lot of good quality for you to hear, and better stuff is on the way. ★ ★ ★

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Electric Auto-Lite, 200 Amps, 24 Volt, 2000 RPM. Dandy arc welder. Wt. 53 lbs. Approx. GOVT cost \$450. Like NEW. \$11.50 incl. easy diagram.

MICROMETERS Chrome plated, precision engineered, carefully toolled to give long life. All new 0-1" esp. \$2.25 ea., 1-2" esp. \$3.50.



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SOLDER **CUT**



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IRRIGATE, FILL TANKS, DRAW WELL WATER. Heavy duty #8 Pumps 7000 GPH. 1000 GPH 75' high — 3000 GPH from 25' well. Rust-proof Alloy Metal. 8 blade impeller. 1" inlet — 1" outlet. Standard Pipe Threaded. Money back guarantee. Send check, **\$11.95** Money Order, or C.O.D.
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Gold Bond Insulation Plank and Tile are pre-finished and give smart good looks in combinations of ivory or pastel colors. Sturdy, made from "live" southern pine fibres, they keep furnace heat in, and summer heat out! Easily applied with a stapling gun... available at your Gold Bond dealer's. Send for complete plans on how to build this room or one similar—then see your Gold Bond dealer.

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Enclosed is 10¢ for Gold Bond How-To-Do-It Plan No. 14 for building this attractive room in our attic.

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Address.....
City..... Zone..... County..... State.....

CRAFTSMAN Circular Saw Blades

REG. TRADE MARK

SEARS HAS 51 DIFFERENT TOP QUALITY BLADES . . .

Tungsten-carbide tipped. Saws wood, metal, plastic, plywood, etc.

= CRAFTSMAN =
Safe Saw

\$7.75

6½-inch

= CRAFTSMAN =
Chisel-Tooth

\$1.69

6-inch

CRAFTSMAN Carbide-tipped Blades

Out-perform similar blades selling for much higher prices! Teeth are tipped with tungsten carbide . . . cutting edges last 20 times longer than ordinary all-steel blades. Safer 8-tooth design . . . each tooth projects only .020 in. above non-cutting edge. Saw can't grab . . . protects you from kickbacks. Cuts faster, easier . . . uses less power . . . needs less resharpening.

Special steel saw blade is heat treated. Rips, cross-cuts, miters. Cuts woods, plastics, plywood, Formica, Masonite, Presdwood, Transite, laminates, asbestos, roofing, aluminum, etc. (NOT for masonry, steel, iron or other ferrous metals.) See this sensational blade at your nearest Sears Retail Store.

Diam.	Arbor Hole	Fits These Saws	Each
5 7/8 in.	13/16 in. diamond	6-in. electric Skil-saw . . .	7.75
6 in.	5/8-1/2 in. round	Porter-Cable electric hand saws; bench saws . . .	7.75
6 in.	1/2 in. square . . .	Mall, PET, DUNLAP electric hand saws . . .	7.75
6 1/4 in.	1 1/4 in. round . . .	6-in. Black & Decker . . .	7.75
6 1/2 in.	1/2 in. round . . .	CRAFTSMAN 6 1/2-in. elec. hand saw; bench saws . . .	7.75
7 in.	5/8-1/2 in. round	Bench saws . . .	8.25
7 in.	13/16 in. diamond	Skil-saw; also Sears former No. 2186 electric hand saw . . .	8.25
7 in.	1/2 in. square . . .	Mall electric hand saw . . .	8.25
8 in.	5/8-1/2 in. round	CRAFTSMAN 8-in. elec. hand saw; bench saws . . .	8.75
8 in.	13/16 in. diamond	Skil-saw elec. hand saw . . .	8.75
8 in.	1 1/4 in. square . . .	Mall electric hand saw . . .	8.75
8 in.	1 1/8 in. round . . .	Black & Decker electric hand saw . . .	8.75
10 in.	*1-3/4-5/8 in.	Bench, builders' radial, round . . .	10.95
12 in.	*1-3/4 in. round . . .	Bench, builders' radial, swing saws . . .	17.50

* Arbor bushed to accommodate either size arbor shown.

† 12 teeth.

CRAFTSMAN Chisel-tooth Blades

Bevel-filed, chisel-shaped tooth has greater hook angle . . . provides a stronger, faster-cutting blade. Cuts up to 30% longer before resharpening or resetting than standard or fancy-tooth combination blades. Reduces vibration . . . easy to sharpen and reset.

Combination type . . . for ripping and crosscutting. Made by new automatic machine methods that eliminate costly hand processes. Chrome-nickel-molybdenum steel . . . scientifically heat treated and hardened. Far superior to high carbon steel used in most circular saws. Evenly tensioned to run true and cut straight. Deep gullets to clear out sawdust. Now available at your nearest Sears Retail Store.

Teeth	Diam.	Arbor Hole	Fits These Saws	Each
16	5 7/8 in.	13/16 in. diamond	Skil-saw electric hand saw . . .	\$1.69
16	6 in.	1/2 in. square . . .	Mall, PET, DUNLAP elec. hand saws . . .	1.69
16	6 in.	*5/8-1/2 in. round	Bench saws . . .	1.69
16	6 1/4 in.	1 1/4 in. round . . .	Black & Decker elec. hand saw . . .	1.69
16	6 1/2 in.	1/2 in. square . . .	PET, DUNLAP electric hand saws . . .	1.69
16	6 1/2 in.	1/2 in. round	CRAFTSMAN 6 1/2-in. electric hand saw . . .	1.69
18	7 in.	*5/8-1/2 in. round	Bench saws . . .	1.89
18	7 in.	1/2 in. square . . .	Mall electric saw . . .	1.89
18	7 1/4 in.	13/16 in. diamond	Skil-saw, Sears former No. 2186 . . .	1.89
20	8 in.	*5/8-1/2 in. round	CRAFTSMAN 8-in. electric hand saw; bench saws . . .	1.98
20	8 1/4 in.	13/16 in. diamond	Skil-saw elec. hand saw . . .	1.98
20	8 1/4 in.	1 1/4 in. round . . .	Black & Decker saw . . .	1.98
20	8 1/2 in.	13/16 in. square	Mall electric saw . . .	1.98
24	10 in.	*5/8-5/8 in. round	Bench saws . . .	2.98
24	12 in.	*1-3/4 in. round . . .	Radial, swing, and commercial saws . . .	4.29

* Arbors bushed to fit either size arbor indicated.

Solve Your Cutting Problems!

SIZES AND TYPES TO FIT ALMOST EVERY POWER SAW

A \$169
6-inch

B \$169
6-inch

C \$169
6-inch

D \$269
6-inch

CRAFTSMAN Crosscut, Rip and Combination type Blades

Professional quality . . . made by improved machine methods that eliminate many costly hand processes. You pay LESS for a MORE accurate saw! Electrically controlled furnaces hold saws flat, temper them under pressure . . . give blades toughness, long-lasting edges. Chrome-nickel-molybdenum steel; heat treated; evenly tensioned to run true. Accurately ground for better balance and surface finish; pitch and gum ore less likely to stick. Will stand up under hardest production use.

For fine woodworking—ripping, crosscutting or mitering—use CRAFTSMAN Hollow-ground Combination Blades. 3-gauge taper grinding gives free, easy cutting. The gradual taper means greater strength . . . allows saw to run without set . . . won't bind. Cuts smoothly enough to glue work without sanding. Cuts slightly slower than flat-ground saw blade.

No matter which type of saw you own—bench, electric hand, radial, swing, builders', or floor model—there's a CRAFTSMAN Blade designed to fit. At your nearest Sears Retail Store.

(A) (B) CRAFTSMAN Flat-ground* Crosscut and Rip Saw Blades

Diameter	Center Hole	R.P.M.	(A) Crosscut	(B) Rip
6 inches	5/8 x 1/2 in.	5080 to 7040	\$1.69	\$1.69
7 inches	5/8 x 1/2 in.	4350 to 6550	1.89	1.89
8 inches	5/8 x 1/2 in.	3820 to 5730	1.98	1.98
10 inches	5/8 x 3/4 in.	3050 to 4580	2.98	2.98
12 inches	1 x 3/4 in.	2540 to 3820	4.29	4.29

(C) CRAFTSMAN Flat-ground Combination Saw Blades

Diameter	Center Hole	R.P.M.	Each
6 inches	5/8 x 1/2 in.	5080 to 7040	\$1.69
7 inches	5/8 x 1/2 in.	4350 to 6550	1.89
8 inches	5/8 x 1/2 in.	3820 to 5730	1.98
10 inches	5/8 x 3/4 in.	3050 to 4580	2.98
12 inches	1 x 3/4 in.	2540 to 3820	4.29

(D) CRAFTSMAN Hollow-ground Combination Saw Blades

Diameter	Gauge	Taper	Center Hole	R.P.M.	Each
6 inches	13	to 18	5/8 x 1/2 in.	5080 to 7040	\$2.69
7 inches	15	to 18	5/8 x 1/2 in.	4350 to 6550	2.98
8 inches	15	to 18	5/8 x 1/2 in.	3820 to 5730	3.89
10 inches	14	to 17	5/8 x 3/4 in.	3050 to 4580	7.25
12 inches	14	to 17	1 in.	3050 to 4580	7.25

* Arbors bushed to fit either size arbor indicated.



CRAFTSMAN 6-in. Dado Set. Converts your bench saw, radial saw or swing saw for dadoing, grooving, rabbeting, etc. Made of tempered high quality steel. Each complete set includes: two 1/8-in. thick outside saws and five chipers (four 1/8 in. thick, and one 1/16 in. thick). Precision ground. With 1/2 or 5/8-in. arbor hole. At your nearest **\$8.75** Sears store . . . Set

CRAFTSMAN 8-inch Dado Set. Heavy duty . . . for dado work with your bench saw, radial saw, or swing saw. Each set includes two outside saws (each cuts 1/8-in. groove), six 1/8-in. inside cutters, and paper washers for 1 1/4-in. width adjustments. Available with 1-in. or 3/4-in. arbor hole. (3/4-in. size includes bushings to fit 5/8-in. arbors.) At your nearest **\$14.95** Sears store . . . Set



Other special-purpose blades—including Nail-cutting, Plywood-cutting, and Fine-tooth Finish Blades—also available at your nearest Sears Store.

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Famous for fine quality . . . precision performance . . . low price!

I'VE TRIED THEM ALL—
THERE'S NOTHING THAT
DOES THE JOB LIKE
PLASTIC WOOD!



Plastic Wood is stronger—resists weather. Sands down to a smooth, hard finish. Professional craftsmen have preferred Plastic Wood for more than 50 years because it takes paint, varnish and other finishes best. Will not chip, crack or peel . . . won't pull away! In cans and tubes.

In natural, white and 8 wood colors.

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PADLOCKS**

Storage buildings, outbuildings, summer camps, sports equipment, garden and farm tools, boats . . . all these and many other things should be put under lock and key NOW. Do it right with Corbin Pin-Tumbler Padlocks! You get real security and economy, too. In every size for every purpose . . . in every price range. At better stores. IF IT'S WORTH LOCKING, IT'S WORTH A CORBIN PIN-TUMBLER PADLOCK!

CORBIN CABINET LOCK Division

The American Hardware Corporation
New Britain, Conn.

After Disaster, The Trouble Shooter . . .

(Continued from page 86)

electrocute a whole company of men. Spurs strapped to knees and ankles, permit the men to clamber up bare poles. Safety belts support them once they're there. With their thick rubber gloves, arm guards and jackets they'll handle hot lines surging with up to 4000 volts of current. Anything higher is worked with long sticks or else the line is de-energized. This doesn't mean they get careless. "A man can be killed just as dead by the 120 volts in a light socket as he can by 60,000 on a pole top," Joe Bain explains.

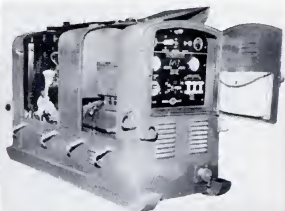
Joe, a square, solid-looking man who has spent some 20 years around power-pole crossarms, can cite plenty of cases to prove his point. Most spectacular was the time when he and his crew buddies were called out in a bitter winter ice storm to hoist live 120,000-volt transmission cables back on the steel towers from which they'd been ripped by the ice and wind. "We'd gotten one back," he recalls. "The other was swinging in the wind, just clear of the ground, when a man came down to our tower and sat on a steel platform to rest. All of a sudden he got up and climbed the tower ladder for no special reason. A second later the wind caught that swinging cable and whammed it against the exact spot where the man had been. There was a crack like a cannon when those 120,000 volts grounded out. A fire ball five feet around lit up the scene. Cable, steel and everything within several feet just melted and disappeared. Don't know where that man is today, but I'll bet he's mighty careful where he sits."

Before he starts work, a lineman shinnies up the pole and slips a rubber line hose, which he calls a "snake," or "eel," over each hot line on both sides of the crossarm. Rubber "boots" cover insulators. A thick rubber blanket is thrown over transformers and other equipment.

All this, when properly fixed, should allow a man to work safely in a high-voltage area, but no good lineman takes anything for granted. "Electricity is tricky stuff," says Jim Mather, one of John Zimmerman's boys. "You get up on those crossarms in rainy weather when the current is leaking here and there and you can feel it tickle your back, or your arm, or your shoulder even though you may not be touching anything hot."

Mather knows just how tricky it is. He got the full wallop one day when his hand

(Continued to page 268)



U. S. GOVERNMENT SURPLUS 3 KVA AC ALL PURPOSE GASOLINE POWERED GENERATOR

3 Phase — can be used single phase

only
\$295⁰⁰

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EMERGENCY STAND-BY POWER**

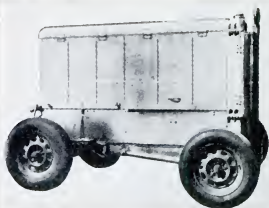
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GOVT. COST GENERATOR \$695⁰⁰
\$6,000.00 OUR PRICE

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- 7500 RPM; 1/7 HP; ht. 3 1/2"; wt. 5 oz.
- precision machined for smooth operation

You just can't beat this price for a precision diesel engine! Streamlined, compact, easy to install. Thousands of satisfied users all over the world. Fast delivery if you ORDER TODAY! Send \$1.05 plus 5c postage.

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SAWS



More For Your Money!

Better in every way . . . larger work tables . . . sturdier frames . . . newest mechanical improvements. Darra-James engineering department is constantly working to give you more for your money.

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IRON, STEEL, BRONZE, BRASS,
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Tool and Equipment breakdowns are always annoying and costly. Don't let them bother you. Get a Dynamic Arc Welder. You can do expert work your very first job. Welders operate on any properly wired 110 V. AC line. Also make your own wrought iron furniture, railings, fences & knick-knacks. Repair fenders, & bobs, etc. with the handiest "tool" in your workshop. A Dynamic Welder will pay for its low cost of \$38.50 F.O.B. In both time and money.

**DYNAMIC INDUSTRIAL type
transformer Arc Welder**
75 amp. output for Industrial
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Chicago 16, Ill.

**EASY
PAY PLAN**

Low down payment. Pay as you weld. Sold on money-back guarantee. Send for details. Complete outfit only.

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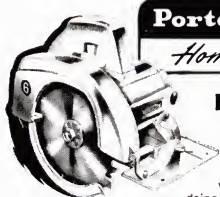
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Here's how to eliminate exhausting hand-sawing forever
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Get this NEW 6-inch



Porter-Cable

Homemaster

**ELECTRIC
SAW**

When it comes to doing things the easy way, Mister, your wife's way takes advantage of modern labor-saving devices. Isn't it about time you caught up?

Take sawing. Why do it the slow, tiresome way? For only \$49.50 you can get this Homemaster Portable Electric Saw that rips . . . cross cuts . . . angle-cuts . . . bevels . . . matches . . . ten times faster and a hundred times easier!

There must be dozens of things you've always wanted to build—but avoided because of the backbreaking hand-sawing involved. Now, do them with this saw! And without the aches and pains.

Compare these features: kick-proof clutch (exclusive), big 8 amp motor, depth and angle adjustments, 6" combination blade, ball bearings, telescoping guard, fully guaranteed. Converts to saw table. An outstanding "Do It Yourself" tool!

ONLY

\$49.50

Easy Payments

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2449 N. Salina St., Syracuse 8, N. Y.

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Tell me all about your low-priced Model 125 Homemaster Saw . . . and where I can get hold of one for a demonstration.

Name.....

Address.....

City.....Zone.....State.....

Makers of SPEEDMATIC and GUILD Electric Tools Since 1906

brushed a protruding line (which shouldn't have been there) from a connection box. The shock knocked him out and he fell back against his safety belt. His crew buddies hauled him down, revived him and he's good as new today except for the scar on one hand and foot. "It burns the point of contact and the place where you ground it out," he explains. "That's why a badly burned lineman may lose a hand and foot. If he touches the line with a hand or arm, the current grounds out in the pole where his spikes are dug in. If he brushes the line with his head, his neck and shoulders may get it."

Odd things happen to a burn victim. "I tasted copper in my mouth for five weeks after it happened," Mather reveals. In most cases, the shock paralyzes diaphragm muscles, so all linemen must know how to use artificial respiration effectively. In many line-crew headquarters, you'll find sawed-off poles where men practice rescuing each other with rope slung over crossarms. One man goes up and fastens the line to the shock victim. Another clammers up and releases the victim's safety belt while the first lowers him. On the floor, they both take turns pumping air into him by artificial respiration.

Since telephone linemen often find their companies' equipment on the same poles with local power lines, they are also trained in similar techniques. You'll find them driving and using much the same kind of pole equipment. Frequently telephone men may be called on to save lives of power linemen, and vice versa. A few years ago in Winona, Miss., telephone man Luther Lamb was led by an excited fellow to a spot down the road from his job. A power line-man atop a 35-foot pole had been burned by a 13,000-volt line and was dangling, unconscious, on his body belt, clothes and hair afire. Lamb shinnied up and beat out the flames with his bare hands. Though working close to the hot lines, he managed to sling a rope around the victim, toss one end over a crossarm so men below could lower him to the ground, where Lamb then rendered first aid until an ambulance came.

Short circuits do start pole-top fires on rare occasions—but probably nothing as spectacular as the one that nearly got a phone-company splicer and his helper in Syracuse, N. Y. The splicer was under one of those platform tents linemen use on pole tops in bad weather, soldering a connection with a gas torch. Suddenly a paraffined wire flared up, burned the gas hose and enveloped him in flame. Bob Case, his helper, was down below and heard the cry of "fire!" He looked up to see a holocaust.

(Continued to page 270)



RESCUE

your car with...

The fellow you see staring at you from this page is the new AC Sludgehound . . . symbol of the tremendously important "rescue work" which is the daily job of AC Oil Filters everywhere.

Each year AC Filters literally rescue millions of cars from the damage that can be done by carbon, grit, dirt and sludge. AC Oil Filters have actually filtered out as much as 1¼ pounds of injurious matter in 5,000 miles. So you see, *regular changing of your AC Oil Filter saves you repair bills, keeps your oil clean all of the time, keeps your engine quiet, keeps it easy on gas and oil.*

Remember the Sludgehound's friendly advice. Ask your Registered AC Dealer to check your oil filter each time he changes your oil . . . and change the filter every 5,000 miles. There's an AC Oil Filter for nearly every make of car and truck.

You get **10** times the filtering area with AC accordion fold



More than **90** sludge-trapping pockets are formed by this fold



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Ask any Registered AC Dealer to attach an AC metal tag to your dipstick; then he can tell you at once when oil and oil filter should be changed to give your engine the proper protection.



AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION



New Mending Tool

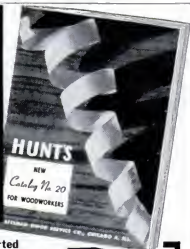
Build and repair with this handy workshop helper. New polyvinyl acetate adhesive is ready to use, forms strong, long-lasting bond on wood and other porous materials. Sets fast. Dries clear. New squeeze bottle makes gluing faster, cleaner, easier. Get the large 8-oz. workshop size. \$1.00 at leading hardware stores. Write for folder. The Borden Company, Chemical Division, Dept. PM-94, 350 Madison Avenue, New York 17, N. Y.



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packed with rare, fancy & imported woods... veneers, plywoods, patterns, tools, ornaments, hardware... everything for the woodworker.

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Racing up the pole, he slashed the tent with a knife, reached inside and grabbed his co-worker by the clothing. With a superhuman effort, he dragged the man out and helped him to the ground. A second later, blazing lines burned through, dumping gas tank, tools, burning platform and tent to the ground.

Case was awarded a silver medal and \$500 for that lifesaving job. The Bell Telephone Company makes a practice of recognizing both individual and group heroics among its employees, with gold, silver or bronze medals (and cash as well) from the Theodore N. Vail memorial fund which was set up for the purpose. Many a telephone lineman's name is on that roll of honor—sometimes for heroics not strictly in the line of duty.

When the Contoocook River flooded an entire New Hampshire village, lineman Michael O'Connor heard that several boats had capsized in the raging torrent, and two exhausted victims were clinging to the top of a telephone pole above water too fast for anyone to get through. O'Connor took a boat out as far as he could. Carrying a cable car and 150 feet of rope, he climbed a swaying pole and rode the strand the remaining distance to the pole to which the victims clung. He sent one man to safety on the cable car, which jammed on the return trip. Then he rode along that line on his safety belt, retrieved the car, tied victim number two on it, and hauled him all the way to safety.

In this age of mechanical perfection you'd think that jobs for the power and telephone linemen should be dwindling. In many ways the young "lightning jerkers" have it easier, according to fellows like Zimmerman and Bain, who remember the days when the only Bushwacker was an ax, and the only Skylift was a man's own leg beef—or a swift kick from his crew chief. But actually, as long as wires come out of the ground and ride overhead, line crews will have work to do.

Why? Storms, earthquakes, fires, floods—and animals. Recently in Northern Michigan a beaver successfully gnawed through a pole butt, brought it crashing down in a tangle of wire and knocked out 11 phone and power circuits.

Linemen tracking down a short circuit in Montana found the cause after days of search—a dead catfish! It was draped across two lines, where it had probably been dropped by a fish hawk. Fish hawks are a menace to line crews—especially on Long Island, where they insist on building their king-size nests on pole crossarms. Bits of wire and metal they use for building

(Continued to page 272)

**DOUBLE ACTION
HYDRAULIC CYLINDER**
ITEM #31C—3 1/2" bore, 11" stroke. Alloy steel cylinder wall. Micro-plated and oil steel 1 1/2" diameter piston rod. 191 1/2" overall length closed. Clevis mounting at base and shaft. Will lift 6025 lbs. with 1000 P.S.I. Pump Pressure. Uses 3/4" tubing fittings. Fits to pipe thread—two 3/4" MPT & 3/4" A \$102.00

value. Shipping weight 11 lbs. F.O.B. Chicago. **25.00**

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ITEM #204 For—
• Insecticide Pumping
• Spraying of D.D.T., D.D., Chlorodane, etc.
• Self-Priming—use as Shallow Well Pump
• For Sump Pumps
• For P.T.O.s, Direct or Pulley Drive
• Rated 1 G.P.M. at 1800 R.P.M., 30 P.S.I., at 1000 R.P.M. and 250 P.S.I. Use 1 1/2" to 2" pipe thread inlet 1" hose outlet. Shipping wt. 15 lbs. F.O.B. Chicago. **24.50**

WELDING GENERATOR

ITEM #90—When connected as a welder, this unit will deliver 200 amps for a sustained period and 250 amps for intermittent service. This generator is widely used for shop-built portable welders. Rated 200 amps, 2500 R.P.M., using 10 H.P. Dimensions: 15" x 6" W. x 8 1/2" H. Spined drive shaft. Gov't. App. cost \$200.00. Ship. wt. 51 lbs. F.O.B. Chicago. **22.50**

High Pressure GLOBE VALVE

ITEM #380—Designed for 3000 P.S.I. aircraft hydraulic systems. 3/4" pipe thread ports. Aluminum alloy body. Alloy steel shaft. Hardened bronze valve seat. Dimensions: 5 1/2" x 2 1/2". Shipping Wt. 1 1/2 lbs. F.O.B. Chicago. **5.95**

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**GROBAN FOUR-WAY OPEN CENTER
HYDRAULIC CONTROL VALVE**

ITEM #126—Four-way open center control valve, with built-in adjustable relief valve factory set at 1000 P.S.I. Springs loaded neutral position. For use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Can be used as single unit or mounted in series. Has 3/4" pipe thread inlet and outlet, 1/2" pipe thread cylinder ports. Finger grip handle. Ship. wt. 10 1/2 lbs. **AN OUTSTANDING BUY! F.O.B. Chicago 21.50**

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Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/2 H.P. Shaft 3/8" diam. Input rotation counter-clockwise facing shaft. Input speed 750 R.P.M. 7 1/2" x 11 1/2" x 11 1/2". Gov't acquisition cost \$428.00. Ship. wt. 51 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago. **54.50**

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**A. C. ELECTRIC
GENERATOR**

ITEM #G-75-D
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PORTABLE ELECTRIC LIGHT PLANT

ITEM #334
Compact Electric Plant suited for small homes, cabins, campers, hunting and fishing camps, trailers and small electrical home appliances. Operating costs: About 3c per hour. Sturdily constructed for dependable service. Net weight only 88 lbs. Can be carried from place to place, or transported in trunk of car. 250-350 Watt—110 Volt—D.C. Model PE-77D. Powered by easy starting 1 Cylinder, 4 Cycle Briggs-Stratton Engine complete with muffler, starting rope and oil bath air cleaner, direct coupled to a 250-350 Watt Generator with twin plug-in outlets. Engine speed 2650 R.P.M. Shipping Wt. 110 lbs. Commercial List Price \$225.00. **WAR SURPLUS PRICE Special Value \$75.00 F.O.B. At Only \$75.00** Chicago
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material continually short out the lines and start grass fires as well. This may burn pole butts for miles around. Phone company linemen think they've finally solved the problem by erecting "bird nest" platforms on special poles to lure the creatures away from the high lines.

Bears, it is said, sometimes hear the lines humming, think it's a swarm of bees, climb a pole and then smash all the crossarms to bits when they discover they've been tricked.

Not long ago, telephone linemen in Kingston, N. Y., were puzzled because they couldn't find where a rural line was grounded out, causing failures on a whole string of subscribers' phones. Then one day a repairman noticed a little knoll where the line dipped within reach of the ground on its way through a farm. There, tethered by a chain to the handy telephone line, stood a nanny goat peacefully grazing—and grounding out the circuit.

Most of the time, however, it's the elements and not two-legged or four-legged creatures who make it necessary for rugged line crews to buck a dozen hazards as they cling to precarious perches in bitter-cold blizzards, buffeted by wind and rain, so you'll have light and phone service. Even the inside of a sturdy line truck isn't always so cozy. F. J. Smith, for instance, a telephone repairman in Port Huron, Mich., was sitting out a storm in such a truck, when a tornado came roaring up the street and took him—truck and all—on a 200-foot unscheduled flight. "I saw poles tumbling and a building came flying toward me," he recalls. "I remember seeing it flatten the car next to me. Next thing I remember the truck was on its side the next street up the block."

In the same storm, another line crew holed up in a truck, suddenly saw poles collapse in front of and behind them, draping 40,000-volt conductors over the truck cab. Knowing their tires would protect them, they sat deathly still for three hours, after their foreman, Norm Schneider, took a long chance, leaped clear and went for help.

In spite of it all, few linemen would swap jobs with anyone. And next time your lights go out and your phone goes dead, you may be sure that the John Zimmermans, Joe Bains and Jim Mathers of your community are out in the dirty weather getting things fixed up as fast as they can.

★ ★ ★

☐ Jupiter's atmosphere is mostly hydrogen and helium, not methane and ammonia, according to a report by the Carnegie Institution of Washington.

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C-20



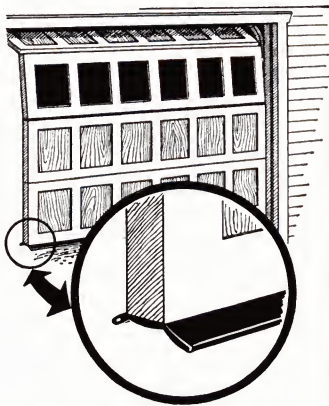
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SEPTEMBER 1954

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Phono Music on a Light Beam

(Continued from page 164)

BEAM TRANSMITTER RESISTORS

Note—K=1000; all carbon 10%

R1=100 K ohms, ½-watt carbon	R8=15 K ohms, 2-watt carbon
R2=½ megohm (log. taper) pot. volume control	R10=500 ohms, wirewound, 10 watt
R3 & R6=2.2 K ohms, ½-watt carbon	R11=470 K ohms, ½-watt carbon
R4 & R9=220 K ohms, ½-watt carbon	R13=47 K ohms, 1-watt carbon
R5 & R12=10 K ohms, ½-watt carbon	R14=4.7 K ohms, ½-watt carbon
R7=10 K ohms, pot. (meter control)	R15=5 K ohms, wirewound, 10 watt

BEAM TRANSMITTER CAPACITORS

C1 & C10=.02 mfd. 400-V., paper type

C2=20 mfd. 25-V.	} Mallory Elect. FP-426
C3=20 mfd. 25-V.	
C4=15 mfd. 450-V.	
C5=20 mfd. 450-V.	
C6=20 mfd. 450-V.	} Mallory Elect. FP-456
C7=40 mfd. 300-V.	
C8=25 mfd. 475-V.	
C9=100 mfd. 50-V.	

The 4½-in. plano-convex lens (flat on one side, bulged on the other) at the transmitter has a focal length of 10 inches. This condenser lens is a type used for arc-lamp projection systems. The one used is No. 85655D, from Central Scientific Co., 1700 Irving Park Rd., Chicago 13, Ill. It is also available as No. 892 from Kliegl Bros., 321 W. 50th Street, New York 19, N. Y.

The Fresnel "step" lens at the receiver is an inexpensive 8-in.-dia. variety having a focal length of 12 in.; available from Kliegl Bros. Their catalog number is 2072. It is also available from many theater-supply houses. The receiving-lens mounting details are shown in Fig. 3. See Fig. 1-A for mounting the lens at the beam transmitter. Note that the focal-length setting is figured from the back of the lens to a

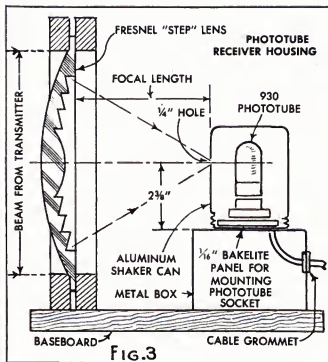
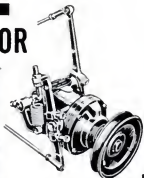


FIG. 3

(Continued to page 276)

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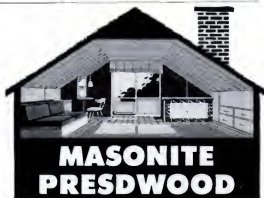
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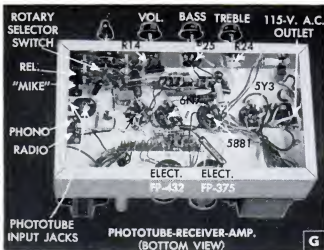
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Note—K=1000; all carbon 10%

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|---|--|
| R1=6.8 K ohms, ½-watt carbon | R17 & R23=47 K ohms, ½-watt carbon |
| R2 & R28=15 K ohms, ½-watt carbon | R18 & R22=2.2 K ohms, ½-watt carbon |
| R3=10 megohms, 1-watt (low noise) carbon* | R19 & R34=100 K ohms, 1-watt carbon |
| R4=3.8 megohms, ½-watt carbon | R20 & R21=100 K ohms, ½-watt carbon |
| R5 & R7=68 K ohms, ½-watt carbon | R24=½ megohm, (log. taper) treble control pot. |
| R6=5 megohms (low noise) carbon* | R25=same as R24 bass control |
| R8, R9, R13 & R15=100 K ohms, ½-watt carbon | R26=10 K ohms, ½-watt carbon |
| R10=27 K ohms, ½-watt carbon | R27 & R30=1 K ohms, ½-watt carbon |
| R11=51 K ohms, ½-watt carbon | R29=470 ohms, ½-watt carbon |
| R12=33 K ohms, ½-watt carbon | R32=300 ohms, wirewound, 5 watts |
| R14=½ megohm (log. taper) pot. volume control | R33=750 ohms, wirewound, 10 watts |
| R16 & R31=470 K ohms, ½-watt carbon | |

*Continental carbon X-type

PHOTOTUBE AMPLIFIER CAPACITORS

- | |
|--|
| C1, C3, C10, C11, C12 & C17=.05 mfd. 400-V. paper type |
| C2 & C13=.001 mfd. 400-V. paper type |
| C4=.0002 mfd. mica type |
| C5, C14 & C21=.01 mfd. 400-V., paper type |
| C6=10 mfd. 450-V. |
| C7=10 mfd. 450-V. |
| C8=250 mfd. 25-V. |
| C9=40 mfd. 450-V. |
| C15=.005 mfd. mica disk cap type |
| C18=.02 mfd. 400-V. paper type |
| C19=40 mfd. 450-V. |
| C20=40 mfd. 450-V. |

Mallory Elect. FP-432

Mallory Elect. FP-432

Mallory Elect. FP-432

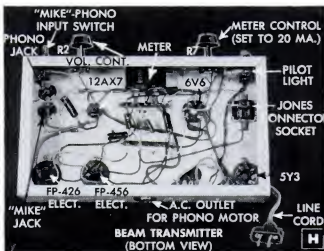
Mallory Elect. FP-432

Mallory Elect. FP-432

Mallory Elect. FP-432

Mallory Elect. FP-432

point ⅜ of an inch back from the front end of the crater glow lamp. Detailed student material list R-427 is available from Popular Mechanics Radio-TV and Electronics department upon receipt of ordinary letter postage. ★ ★ ★



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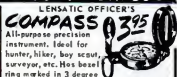
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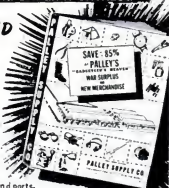
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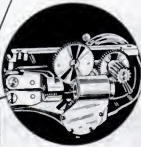
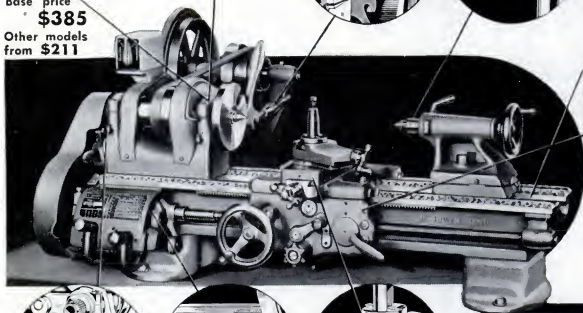
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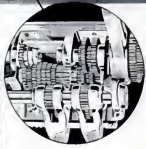
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